











unwritten

53205/A

$$\begin{array}{r} 4136 \\ 405 \\ \hline 3730 \end{array}$$

$$\begin{array}{r} 42:10 \\ 1029 \\ \hline 3141 \end{array} \quad \begin{array}{r} 3214 \\ 3141 \\ \hline 36 \end{array}$$

12

*The Latitude of Burnley*  
*53:50 North*

*18:52*  
THE  
*737*

Mariners Compass  
RECTIFIED.



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 cator; or Books of any other Subjects; Paper, or Paper Books  
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86957

*W. Golds* THE *Book 1738*

# Mariners Compass

RECTIFIED:

*H. Hoods Back*

Containing TABLES, shewing the true Hour of the Day, the Sun being upon any Point of the Compass: The Time of the *Rising* and *Setting* of the *Sun* and *Stars*, and the Points of the *Compass* that the *Sun* and *Stars* rise and set with: And Tables of *Amplitude*: With a Table of the *Latitude* and *Longitude* of Places. Calculated from the *Equinoctial*, to 60 deg. of *Latitude*, &c.

Also a Description and Use of those Instruments  
most in Use in the Art of Navigation.

*Yellow Book*  
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By Andrew Wakely, *Math.*

Carefully Corrected, and very much Enlarged,  
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To

## To the R E A D E R.

Courteous Reader,

**W**HEN I first entred upon these my Labours and after I had begun the Calculation; I found, that tho' the Book be small, yet my Labour was so great that I almost fainted. Yet at length, when I considered the ordinary, necessary, and frequent Use that might be made of these my Labours, I was thereby encouraged to go on and prosecute my Work; and how ready and easie I have made it for actual Performance, will plainly appear, by immediate inspection, to the meanest Capacity.

Here follows a breif Explanation of the Method and Order of the Book. First, You will find Tables of the Sun's Declination, newly Calculated from the best Hypothesis yet discovered, and applied to the Meridian of London, whose Latitude is 51d. 32m. and Longitude according to my Table 0d. 0m. Next you will find Tables shewing the true Hour and Minute of the Day, the Sun being upon any Point of the Compass; which Tables are as Dials, fitting all Places in the World, whose Pole is Elevated, not above 60d. either North or South. Likewise by these Tables you may know the true Hour and Minute of the Night, by the bearing of any of the known fixed Stars between the Tropicks. Then you will find Tables shewing the true Time of the Sun's Rising and Setting, with the Length of the Day and Night. Also by these Tables you may find the true Time of Rising and Setting of all the eminent fixed Stars between the

*Tropicks.* Next you will find Tables shewing the Points of the Compass that the Sun and all the abovesaid Stars rise and set with; which Tables are of excellent use for the ready finding of the Variation of the Compass, and may be performed by a Meridian-Compass that is about ten Inches in Diameter, whose Points being divided into halves and quarters; such a Compass I suppose to be convenient for the Mariners Use, where he hath not an Azimuth Compass. Next you will find Tables of Amplitudes to every Degree of the Sun's Declination. All these Tables are Calculated from the Equinoctial to sixty Degrees of Latitude, either North or South, and they will last with Exactness as long as God upholdeth the Order and Course of Nature.

In the Appendix you will find the use of all those Instruments that are most in use in the Art of Navigation, either for Operation or Observation. Likewise a Table containing the most and chiefeſt Harbours, Headlands and Islands in the World, shewing the Latitude and Longitude of each of them, beginning the Longitude at the Meridian of London, newly Composed in a new successive Order.

This Method I own, but how I have acquitted my self therein I shall leave to the Judgments and Experiments of the skilfullest Mariners that the World affords, which are my native Countrymen of England.

Fare ever well, so wishes he,  
Who is more yours than he can seem to be.

Andrew Wakely.

The



## The Corrector to the Reader.

*Candid Reader,*

**B**EING desired by the Bookseller concern'd herein, I willingly undertook the Viewing and Correcting this Treatise, and the rather for that Respect I bear to the Memory of my Master, the Deceased Author) which for its Usefulness hath obtained good Esteem with our Navigators: I therefore have took the greater Pains, spent much Time in examining each Table, correcting, mending, altering, explaining, and enlarging where I saw cause: having endeavoured to render the whole of the *Mariners Compass Rectified* most familiar and easie to an ordinary Capacity.

In this Edition I have contracted the *Tables of Amplitudes in Points of the Compass*, and yet as intelligible as before; by which having made more Room, I have made the Reader amends with large Additions in the Use of each Table, and methodizing the Discourse throughout: But most especially in the Use of Instruments; I have taken Liberty to Repair, Alter, and Enlarge, that it will appear as good as new; but chiefly in the *Description and Use of the Gunter, Sliding-Gunter, and Sector*: Principally the two former; whose Uses I have shewed in *Arithmetick*, to *Multiply, Divide*, and work the *Rule of Three*; in *Geometry*, to work *Proportions, Continual, Duplicate or Triplicate*;

*Mensuration of Superficies, and Solids; as to measure Boards, Timber, Stone, Gauging of Vessels, and Tunnageing of Ships, Bales or Boxes: Also in Gunnery. And in Navigation, both in Plain and Mercators Sailing: In Astronomy, in the most useful Problems; as to find the Sun's Place, Declination, Rising, Setting, Amplitude, Azimuth, Hour, and Altitude at all times. And in all, you are directed plainly to perform them, both by Sliding-Gunter, and with Compasses.*

*In the Table of Latitude and Longitude I have added many Places of Note, and omitted some few that were of little Moment, and have corrected both the Latitudes and Longitudes of the most Eminent, according to the latest Observations: So that I am bold to say it's the most exact Table of it's kind extant.*

*These with many other Additions, through the whole, I hope will find acceptance with young Students in the Mathematicks, and prove serviceable to them both in their Studies, and Practice of Navigation, and other Parts of the Mathematicks; for whose sakes I took the greater Pains herein, who am an obliged Servant to teach them what may here be wanting,*

*3 8th Sept.  
1693.*

*James Atkinson.*

EXACT

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EXACT  
**TABLES**  
 Of the SUN's  
*DECLINATION:*

Calculated from the best *Hypothesis* yet Discovered, and  
 applied to the *Meridian* of  
**LONDON,**

			D.	M.
Whose	{ Latitude } { Longitude }	is {	51 :	32
			00 :	00

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*The Mariners Compass Rectified.**First Year after Leap-Year.*

Sun's Declination, 1713. 1717. 1721. 1725.

Days.	Janua.		Febr.		March.		April.		May.		June.	
	South.		South.		South.		North.		North.		North.	
1	21	39	13	39	03	17	08	43	18	09	23	11
2	21	28	13	19	02	53	09	05	18	24	23	15
3	21	18	12	59	02	29	09	26	18	39	23	18
4	21	07	12	38	02	05	09	47	18	53	23	21
5	20	56	12	17	01	42	10	09	19	07	23	23
6	20	44	11	56	01	18	10	30	19	21	23	25
7	20	32	11	35	00	54	10	51	19	34	23	27
8	20	19	11	14	00	31	11	12	19	47	23	28
9	20	06	10	53	00	07	11	32	20	00	23	29
10	19	53	10	31	Nor. 16		11	53	20	12	23	29
11	19	38	10	09	00	40	12	13	20	25	23	29
12	19	25	09	47	01	04	12	33	20	36	23	29
13	19	11	09	25	01	27	12	53	20	48	23	28
14	18	56	09	03	01	51	13	13	20	59	23	27
15	18	41	08	40	02	14	13	32	21	09	03	25
16	18	26	08	18	02	38	13	51	21	19	23	23
17	18	10	07	55	03	01	14	10	21	29	23	20
18	17	54	07	32	03	25	14	29	21	39	23	17
19	17	38	07	10	03	48	14	47	21	48	23	14
20	17	21	06	47	04	11	15	06	21	57	23	10
21	17	04	06	24	04	34	15	24	22	05	23	06
22	16	47	06	01	04	57	15	42	22	13	23	01
23	16	29	05	37	05	20	15	59	22	21	22	56
24	16	12	05	14	05	43	16	16	22	28	22	51
25	15	53	04	51	06	06	16	33	22	35	22	45
26	15	35	04	27	06	29	16	50	22	41	22	39
27	15	16	04	04	06	51	17	06	22	47	22	32
28	14	57	03	40	07	14	17	23	22	53	22	25
29	14	38			07	36	17	38	22	58	22	18
30	14	19			07	58	17	54	23	03	22	10
31	13	59			08	21			23	07		



# The Mariners Compass Rectified.

I.I.

The First Year after Leap-Year.

Sun's Declination 1713. 1717. 1721. 1725.

Days.	July.	August	Septem.	October.	Novem.	Decem.
	North.	North.	North.	South.	South.	South.
1	22 02	15 02	04 12	07 25	17 46	23 08
2	21 53	14 44	03 49	07 48	18 02	23 12
3	21 44	14 25	03 26	08 10	18 18	23 16
4	21 35	14 07	03 03	08 33	18 33	23 20
5	21 25	13 48	02 40	08 55	18 48	23 22
6	21 15	13 29	02 16	09 17	19 03	23 24
7	20 05	13 09	01 53	09 39	19 18	23 26
8	20 54	12 50	01 30	10 01	19 32	23 28
9	20 43	12 30	01 06	10 23	19 46	23 29
10	20 33	12 10	00 43	10 44	19 59	23 29
11	20 20	11 50	00 19	11 06	20 12	23 29
12	20 08	11 30	Sou. 04	11 27	20 25	23 29
13	19 56	11 09	00 27	11 48	20 37	23 27
14	19 44	10 48	00 51	12 09	20 49	23 26
15	19 30	10 28	01 14	12 29	21 01	23 24
16	19 17	10 17	01 38	12 50	21 12	23 22
17	19 04	09 43	02 01	13 10	21 22	23 19
18	18 49	09 24	02 25	13 30	21 33	23 16
19	18 34	09 03	02 48	13 40	21 43	23 12
20	18 20	08 41	03 12	14 10	21 52	23 08
21	18 05	08 19	03 36	14 29	22 01	23 03
22	17 50	07 57	03 58	14 48	22 10	22 58
23	17 34	07 35	04 22	15 07	22 18	22 52
24	17 18	07 13	04 45	15 26	22 26	22 46
25	17 02	06 51	05 08	15 44	22 34	22 39
26	16 46	06 28	05 31	16 03	22 41	22 32
27	16 29	06 06	05 54	16 20	22 47	22 25
28	16 12	05 43	06 17	16 38	22 53	22 17
29	15 55	05 21	06 40	16 55	22 58	22 09
30	15 38	04 58	07 03	17 13	23 05	22 02
31	15 20	04 35		17 29		21 51

*The Mariners Compass Rectified.**Second Year after Leap-Year.*

Sun's Declination, 1714. 1718. 1722. 1726.

Days.	Janua.		Febr.		March.		April.		May.		June.	
	South.		South.		South.		North.		North.		North.	
1	21	41	13	44	03	22	08	37	18	06	23	10
2	21	31	13	24	02	59	08	59	18	21	23	14
3	21	21	13	04	02	35	09	21	18	35	23	17
4	21	10	12	43	02	11	09	42	18	50	23	20
5	20	59	12	22	01	48	10	03	19	04	23	23
6	20	47	12	01	01	24	10	25	19	18	23	25
7	20	35	11	40	01	00	10	46	19	31	23	26
8	20	22	11	19	00	37	11	07	19	44	23	28
9	20	10	10	58	00	13	11	27	19	57	23	29
10	19	56	10	36	Nor. 10		11	48	20	10	23	29
11	19	43	10	14	00	34	12	08	20	22	23	29
12	19	29	09	52	00	58	12	28	20	33	23	29
13	19	15	09	30	01	21	12	48	20	45	23	28
14	19	00	09	08	01	45	13	08	20	56	23	27
15	18	45	08	46	02	08	13	27	21	07	23	25
16	18	30	08	23	02	32	13	47	21	17	23	23
17	18	24	08	01	02	55	14	06	21	27	23	21
18	17	58	07	38	03	18	14	24	21	36	23	18
19	17	42	07	15	03	42	14	43	21	45	23	14
20	17	25	06	52	04	05	15	01	21	54	23	11
21	17	08	06	29	04	29	15	19	22	03	23	07
22	16	51	06	06	04	52	15	37	22	11	23	02
23	16	34	05	43	05	15	15	55	22	19	22	57
24	16	16	05	20	05	38	16	12	22	26	22	52
25	15	58	04	57	06	01	16	19	22	33	22	46
26	15	39	04	33	06	23	16	46	22	40	22	40
27	15	21	04	09	06	46	17	02	22	46	22	34
28	15	02	03	46	07	08	17	19	22	51	22	27
29	14	43			07	31	17	35	22	57	22	20
30	14	23			07	53	17	50	23	02	22	12
31	14	04			08	15			23	06		

# The Mariners Compass Rectified.

13

The Second Year after Leap-Year.

Sun's Declination, 1714. 1718. 1722. 1726.

Days.	July.		August.		Septem.		October.	Novem.		Decem.
	North.		North.		North.		South.	South.		South.
1	22	04	15	06	04	18	07 20	17	42	23 07
2	21	54	14	48	03	55	07 42	17	58	23 11
3	21	46	14	30	03	32	08 05	18	14	23 15
4	21	37	14	11	03	08	08 27	18	29	23 19
5	21	28	13	52	02	45	08 50	18	45	23 22
6	21	18	13	33	02	22	09 12	18	59	23 24
7	21	08	13	14	01	59	09 34	19	14	23 26
8	20	57	12	54	01	35	09 56	19	28	23 28
9	20	46	12	35	01	12	10 17	19	42	23 28
10	20	35	12	15	00	48	10 40	19	56	23 29
11	20	23	11	55	00	25	11 00	20	09	23 29
12	20	11	11	35	00	02	11 22	20	22	23 29
13	19	59	11	14	Sou. 22		11 43	20	34	23 28
14	19	46	10	53	00	45	12 03	20	46	23 27
15	19	33	10	33	01	09	12 24	20	58	23 25
16	19	20	10	12	01	32	12 45	21	09	23 22
17	19	06	09	51	01	56	13 05	21	20	23 19
18	18	52	09	29	02	19	13 25	21	30	23 16
19	18	38	09	08	02	42	13 45	21	40	23 12
20	18	23	08	46	03	06	14 05	21	50	23 09
21	18	08	08	25	03	29	14 24	21	59	23 04
22	17	53	08	03	03	53	14 44	22	08	22 59
23	17	38	07	41	04	16	15 03	22	16	22 53
24	17	22	07	19	04	39	15 21	22	24	22 47
25	17	06	06	56	05	02	15 40	22	32	22 41
26	16	50	06	34	05	25	15 58	22	39	22 34
27	16	33	06	12	05	48	16 16	22	45	22 27
28	16	16	05	49	06	11	16 34	22	52	22 19
29	15	59	05	26	06	34	16 51	22	57	22 11
30	15	42	05	04	06	57	17 08	23	02	22 02
31	15	24	04	41			17 25			21 53

*The Mariners Compass Rectified.**Third Year after Leap-Year.*

Sun's Declination, 1715. 1719. 1723. 1727.

Days.	Januar.		Februa.		March.		April.		May.		June.	
	South.		South.		South.		North.		North.		North.	
1	21	43	13	49	03	28	08	32	18	02	23	09
2	21	33	13	29	03	04	08	54	18	17	23	13
3	21	23	13	09	02	41	09	15	18	32	23	17
4	21	12	12	48	02	17	09	37	18	46	23	20
5	21	01	12	27	01	54	09	58	19	01	23	22
6	20	50	12	06	01	30	10	20	19	14	23	24
7	20	38	11	46	01	06	10	41	19	28	23	26
8	20	25	11	24	00	43	11	02	19	41	23	27
9	20	13	11	03	00	19	11	22	19	54	23	28
10	20	00	10	41	Nor. 05		11	43	20	06	23	29
11	19	46	10	20	00	28	12	03	20	18	23	29
12	19	32	09	58	00	52	12	23	20	30	23	29
13	19	18	09	36	01	16	12	43	20	42	23	28
14	19	04	09	14	01	39	13	03	20	53	23	27
15	18	49	08	51	02	03	13	23	21	04	23	25
16	18	33	08	29	02	26	13	42	21	14	23	23
17	18	18	08	06	02	50	14	01	21	24	23	21
18	18	02	07	44	03	13	14	20	21	34	23	18
19	17	46	07	21	03	36	14	39	21	43	23	15
20	17	29	06	58	04	00	14	57	21	52	23	12
21	17	13	06	35	04	23	15	15	22	01	23	08
22	16	55	06	12	04	46	15	33	22	09	23	03
23	16	38	05	49	05	09	15	51	22	17	22	58
24	16	20	05	25	05	32	16	08	22	24	22	53
25	16	02	05	02	05	55	16	25	22	31	22	48
26	15	44	04	39	06	18	16	42	22	38	22	42
27	15	25	04	15	06	40	16	58	22	44	22	35
28	15	07	03	52	07	03	17	15	22	50	22	28
29	14	48			07	25	17	31	22	55	22	21
30	14	28			07	48	17	46	23	00	22	14
31	14	09			08	10			23	05		



# The Mariners Compass Rectified.

15

The Third Year after Leap-Year.

Sun's Declination, 1715. 1719. 1723. 1727.

Days.	July.			August.		Septem.		October.		Novem.		Decem.	
	North.			North.		North.		South.		South.		South.	
1	22	05	15	11	04	23	07	14	17	38	23	06	
2	21	57	14	53	04	00	07	37	17	54	23	10	
3	21	49	14	34	03	57	08	00	18	10	23	14	
4	21	40	14	16	03	14	08	22	18	26	23	18	
5	21	30	13	57	02	51	08	44	18	41	23	24	
6	21	20	13	38	02	28	09	06	18	56	23	23	
7	21	10	13	19	02	04	09	28	19	11	23	25	
8	21	00	12	59	01	41	09	50	19	25	23	27	
9	20	49	12	40	01	18	10	12	19	39	23	28	
10	20	38	12	20	00	54	10	34	19	52	23	29	
11	20	26	12	00	00	31	10	55	20	06	23	29	
12	20	14	11	40	00	07	11	17	20	19	23	29	
13	20	02	11	19	Sou.	16	11	38	20	31	23	28	
14	19	49	10	59	00	39	11	59	20	43	23	27	
15	19	36	10	38	01	03	12	19	20	55	23	25	
16	19	23	10	17	01	26	12	40	21	06	23	23	
17	19	09	09	56	01	50	13	00	21	17	23	20	
18	18	57	09	35	02	13	13	21	21	28	23	17	
19	18	41	09	13	02	37	13	40	21	38	23	14	
20	18	27	08	52	03	00	14	00	21	48	23	10	
21	18	12	08	30	03	24	14	20	21	57	23	05	
22	17	57	08	08	03	47	14	39	22	06	23	00	
23	17	42	07	46	04	10	14	58	22	14	22	55	
24	17	26	07	24	04	33	15	17	22	22	22	49	
25	17	10	07	02	04	57	15	35	22	30	22	43	
26	16	54	06	40	05	20	15	54	22	37	22	36	
27	16	37	06	17	05	43	16	12	22	44	22	28	
28	16	20	05	55	06	06	16	29	22	50	22	21	
29	16	03	05	32	06	29	16	47	22	56	22	13	
30	15	46	05	09	06	52	17	04	23	01	22	04	
31	15	28	04	46			17	21			21	58	

*Leap-Year.*

Sun's Declination, 1716. 1720. 1724. 1728.

Days.	Januar.		Februa.		March.		April.		May.		June.	
	South.		South.		South.		North.		North.		North.	
1	21	46	13	54	03	10	08	48	18	13	23	12
2	21	36	13	34	02	47	09	10	18	28	23	16
3	21	26	13	14	02	23	09	32	18	43	23	19
4	21	15	12	53	01	59	09	53	18	57	23	22
5	21	04	12	33	01	36	10	14	19	11	23	24
6	20	53	12	12	01	12	10	35	19	24	23	26
7	20	41	11	51	00	48	10	56	19	38	23	27
8	20	29	11	30	00	25	11	17	19	51	23	28
9	20	16	11	08	00	01	11	38	20	03	23	29
10	20	03	10	47	Nor. 23		11	48	20	16	23	29
11	19	50	10	25	00	46	12	19	20	28	23	29
12	19	36	10	03	01	10	12	38	20	39	23	28
13	19	22	09	41	01	34	12	58	20	50	23	27
14	19	07	09	19	01	57	13	18	21	01	23	26
15	18	52	08	57	02	21	13	37	21	12	23	24
16	18	37	08	34	02	44	13	56	21	22	23	22
17	18	21	08	12	03	08	14	15	21	32	23	19
18	18	05	07	49	03	31	14	34	21	41	23	16
19	17	50	07	26	03	54	14	52	21	50	23	12
20	17	34	07	03	04	17	15	11	21	59	23	09
21	17	17	06	40	04	41	15	28	22	07	23	04
22	17	00	05	17	05	04	15	46	22	15	23	59
23	16	42	05	54	05	27	16	04	22	23	22	54
24	16	25	05	31	05	49	16	21	22	30	22	49
25	16	07	05	08	06	12	16	38	22	36	22	43
26	15	48	04	44	06	35	16	54	22	43	22	37
27	15	30	04	21	06	57	17	11	22	49	22	30
28	15	11	03	57	07	20	17	27	22	54	22	23
29	14	52	03	34	07	42	17	43	22	58	22	16
30	14	33			08	04	17	58	23	04	22	08
31	14	13			08	26			23	08		

Leap-Year.

Sun's Declination, 1716. 1720. 1724. 1728.

Days.	July.		August.		Septem.		October.		Novem.		Decem.	
	North.		North.		North.		South.		South.		South.	
1	21	59	14	57	04	06	07	32	17	50	23	09
2	21	51	14	39	03	43	07	54	18	06	23	13
3	21	42	14	20	03	20	08	14	18	22	23	17
4	21	32	14	01	02	57	08	39	18	37	23	20
5	21	23	13	42	02	33	09	01	18	52	23	23
6	21	13	13	23	02	10	09	23	19	07	23	25
7	21	02	13	04	01	47	09	45	19	22	23	26
8	20	51	12	44	01	23	10	07	19	36	23	28
9	20	40	12	24	01	00	10	29	19	49	23	29
10	20	29	12	04	00	36	10	50	20	02	23	29
11	20	17	11	44	00	13	11	11	20	15	23	29
12	20	05	11	24	Sou. 10		11	33	20	28	23	28
13	19	53	11	04	00	34	11	54	20	40	23	27
14	19	39	10	43	00	57	12	14	20	52	23	26
15	19	26	10	22	01	21	12	35	21	03	23	24
16	19	13	10	01	01	44	12	55	21	15	23	21
17	18	59	09	40	02	08	13	16	21	25	23	18
18	18	45	09	18	02	31	13	36	21	35	23	15
19	18	30	08	57	02	55	13	55	21	45	23	11
20	18	16	08	35	03	18	14	15	21	54	23	06
21	18	01	08	13	03	41	14	34	22	03	23	01
22	17	45	07	52	04	05	14	54	22	12	22	56
23	17	30	07	29	04	28	15	12	22	20	22	50
24	17	14	07	07	04	51	15	31	22	28	22	44
25	16	58	06	45	05	14	15	49	22	35	22	37
26	16	41	06	23	05	37	16	07	22	42	22	30
27	16	24	06	00	06	00	16	25	22	48	22	23
28	16	07	05	37	06	23	16	43	22	54	22	15
29	15	52	05	15	06	46	17	00	23	00	22	06
30	15	33	04	52	07	09	17	17	23	05	21	57
31	15	15	04	29			17	34			21	48

*A Description of the TABLES of the Sun's Declination.*

**T**Hese Tables are in general for Four Years ; *Leap-Year, First, Second, and Third Year after Leap-Year ; but consequential for any Year.*

Each Year taking up two Pages, hath the first Six Months of the Year on the Left-hand Page, and the last Six Months on the Right-hand Page ; the Names of the Months are at the Head of each Column, with the Days of each Month in the Left-hand Column of each Page.

The First Table sheweth the Sun's Declination every Day for the First Year after Leap-Year, being 1713, 1717, 1721, 1725, &c. and takes up Page (10) and (11) The Second Table is for 1714, 1718, 1722, 1726, &c. being Second Years after Leap-Year in Page (12) and (13) The next Table in Page (14) and (15) is for the Third Year after Leap-Year : The Fourth Table in Page (16) and (17) sheweth the Sun's Declination for Leap-Year, being 1716, 1720, 1724, 1728, &c.

Under the Name of the Month, is the Name of the Declination, either North or South, only the Columns for March, and September are two Names ; that is, under March is South, and against the 10th Day is Nor. for North ; and under September is North, and against the 12th or 13th Day is Sou. for South ; intimating the Declination is South in March, till the 10th Day, and all the remaining part of that Month it's Nor. or North ; in like manner in September ; it's North till the 12th or 13th Day, and from thence to the Months end it's Sou. or South.



*The Use of the Tables of Declination.*

**T**O find the Sun's Declination for any Day in any Year, is after this manner.

1. Seek the Year and Month at the Head of the Table ; with the Day of the Month in the Left-hand Column.

2. Then right against the Day of the Month (in the Left-hand Column) and under the Month at the Head is the Sun's Declination required.

*Example 1.* I desire to know the Sun's Declination for the 24th Day of April 1718.

The Year 1718, is the *Second-Year* after *Leap-Year*, which is in Page (12) then under *April*, and against 24 (under Days) is 16 12, with North at the Head of the Table under *April* ; which sheweth the Sun's Declination on the 24th of April 1718, is 16d. 12m. North.

*Example 2.* What is the Sun's Declination for the 10th Day of March 1719 ?

The Year 1719, being the *Third Year* after *Leap-Year*, is found in Page 14 ; then against the 10th Day, under *March* is Nor. 04, signifying the Sun's Declination at that time given, is 0d. 4m. North ; the like do for any other time.

*A Table whereby you may proportion the Sun's Declination to any other Meridian.*

		<i>The daily difference in Declination.</i>											
		m.	m.	m.	m.	m.	m.	m.	m.	m.	m.	m.	m.
East West	Longitude.	2	4	6	8	10	12	14	16	18	20	22	24
		m.	m.	m.	m.	m.	m.	m.	m.	m.	m.	m.	m.
East Long. with Decl.	15	0	0	0	0	0	0	1	1	1	1	1	1
	30	0	0	0	1	1	1	1	1	1	2	2	2
	45	0	0	1	1	1	1	2	2	2	2	3	3
	60	0	1	1	1	2	2	2	3	3	3	4	4
	75	0	1	1	2	2	2	3	3	4	4	5	5
Decr. Subt. but Decl.	90	0	1	1	2	2	3	3	4	4	5	5	6
	105	1	1	2	2	3	3	4	5	5	6	6	7
	120	1	1	2	3	3	4	5	5	6	7	7	8
	135	1	1	2	3	4	4	5	6	7	7	8	9
	150	1	2	2	3	4	5	6	7	7	8	9	10
Decr. Incr.	165	1	2	3	4	5	5	6	7	8	9	10	11
	180	1	2	3	4	5	6	7	8	9	10	11	12

*The Use of this Table of Proportion.*

**T**HE Tables of the *Sun's Declination* are calculated for the Meridian of *London*, and will serve any place under that Meridian; but for those places situate Easterly or Westerly from it, the *Declination* must be proportioned according to his daily Difference in the Table, and Longitude of those places, from the Meridian of *London*, for which purpose this Table is useful, as is evident by these Examples following.

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Ex-

*Example 1.*

Admit the 10th day of April, Anno 1720, I am in Longit. 105 d. East; I demand what Declination the Sun will have that Day in the Meridian of that Place?

The Declination for April 10. on the Meridian of London is 11 d. 58 m. increasing, and the daily difference at that time is 20 m. Therefore in this Table, I look in the head thereof for the nearest number to 20 m. which is 20 m. then I look on the Left-hand of the Table for 105 d. the Longitude that I am in, and in the common Angle of meeting I find 6, which is to be deducted from the Declination in the Meridian of London aforesaid 11 d. 58 m. and the Remainder will be the Declination for that Meridian, or the Longitude that I am in, which is 11 d. 52 m. North. But if the Declination had decreased, as it doth here increase, then you must have added as here under you may see.

	d.	m.
The Declination in the Meridian of London	11	58 N.
The proportional Minute subtract	00	06
The Declin. for the Longitude of 105 d. E. is	11	52 N.
The Declin. for the Longitude of 105 d. W. is	12	04 N.

*Example 2.*

Admit the 10th Day of October, Anno 1718, I am in Longitude 87 d. West, I demand the Declination, that the Sun will have that Day in the Meridian?

The daily Difference in the Table of Declination, at this time is 21 m. and the Proportional part thereof by the last Table is 5 m.

	d.	m.
The Declination in the Meridian of London,	10	38 S.
The proportional Minutes, add	00	05
The Declin. in the Longitude of 87 d. W. is	10	43 S.
The Declin. in the Longitude of 87 d. E. is	10	33 S.

*A Table of the Refractions of Sun, Moon, and Stars  
according to the Observations of Tycho Brahe.*

<i>Altitudes.</i>	<i>Sun.</i>	<i>Moon.</i>	<i>Stars.</i>	<i>Altitudes.</i>	<i>Sun.</i>	<i>Moon.</i>
0	34	33	30	18	06	06
1	26	25	21	19	05	06
2	20	20	15	20	04	05
3	17	17	12	21	04	05
4	15	15	11	22	03	04
5	14	14	10	23	03	04
6	13	13	09	24	03	04
7	12	13	08	25	02	03
8	11	12	07	26	02	03
9	10	11	06	27	02	03
10	10	11	05	28	02	02
11	09	10	05	29	02	02
12	09	09	04	30	01	02
13	08	09	04	31	01	02
14	08	08	03	32	01	01
15	07	08	03	33	01	01
16	07	07	02	34	01	01
17	06	07	02	35	01	01

The Refraction of the *Sun*, *Moon*, and *Stars*, causeth them to appear higher above the *Horizon* than they are ; therefore the Refraction is always to be subtracted from the *Altitude* observed, that the true *Altitude* may be had.

As admit the *Sun's Meridian Altitude*, by Observation to be 5d. I demand the true *Altitude* ?

	d.	m.
<i>Altitude by Observation</i> —————	05	00
<i>Refraction, subtract</i> —————	00	14
<i>The true Meridian Altitude</i> —————	04	46

*Primum*



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*Primum Mobile ;*

O R,

**Astronomical Tables.**

*Each Table being a SUN DIAL:*

SHEWING

The Exact Hour of the Day, the Sun being upon any Point of the Compass, fitting all Places upon the Earth and Sea, that lie between the *Equinoctial* and 60d. of Latitude, either North or South : And to last with Exactness as long as the Great and Everlasting Creator shall be pleased to hold together the great and wonderful Fabrick of Nature.

*A Sun-Dial for the Latitude of 0 Degree.*

### North Declination.

Deg. Min.	0 d	2 d	5 d	7 d	10 d	12 d	15 d	17 d	20 d	22 d	23 d
	30m			30m		30m		30m		30m	30m
Point	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
North	12	12	12	12	12	12	12	12	12	12	12
n by w	Zen.	0.02	0.04	0.06	0.08	0.10	0.12	0.14	0.17	0.19	0.20
n n w		0.04	0.08	0.12	0.17	0.21	0.25	0.30	0.35	0.39	0.42
nw by n		0.07	0.13	0.20	0.27	0.34	0.41	0.49	0.56	1.03	1.00
n w		0.10	0.20	0.30	0.41	0.51	1.02	1.14	1.25	1.36	1.47
nwbw		0.15	0.30	0.45	1.01	1.18	1.35	1.53	2.12	2.32	2.52
w nw		0.24	0.49	1.14	1.41	2.09	2.41	3.18	4.06	5.07	
w by w		0.51	1.44	2.46	4.10						
West.	6.00										
☉ set	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00
Sun's	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.
Amb.	0.00	2.30	5.00	7.30	10.00	12.30	15.00	17.30	20.00	22.30	23.30

### South Declination.

[illegible]



*A Sun-Dial for the Latitude of 2 Degree.*

## North Declination.

0 d	2 d	5 d	7 d	10 d	12 d	15 d	17 d	20 d	22 d	23 d
	30m		30m		30m		30m			30m
h m Point	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
12 North	12	12	12	12	12	12	12	12	12	12
0.02 n by w	Zen. West.	0.02	0.04	0.07	0.09	0.11	0.13	0.15	0.17	0.18
0.03 n n w		0.05	0.09	0.13	0.18	0.22	0.27	0.32	0.36	0.38
0.05 n w by n		0.08	0.15	0.22	0.29	0.36	0.43	0.51	0.57	1.01
0.08 n w		0.12	0.22	0.33	0.43	0.54	1.05	1.17	1.27	1.35
0.12 n w by w		0.18	0.37	0.49	1.05	1.22	1.40	2.00	2.16	2.30
0.16 w n w		0.29	0.55	1.21	1.50	2.21	2.58	3.45	4.46	
0.40 w by n		1.03	2.03	3.23						
6.00 West.	6.00									
6.00 ☉ set.	6.00	6.00	6.01	6.01	6.02	6.02	6.02	6.03	6.03	6.04
d.m. Sun's d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.
0.00 Amp.	23.0	5.00	7.30	10.0	12.30	15.0	17.31	20.1	22.1	23.3

## South Declination.

Deg.	0 d	2 d	5 d	7 d	10 d	12 d	15 d	17 d	20 d	22 d	23 d
Min.		30m		30m		30m		30m		30m	
Point	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
Sou h	12	12	12	12	12	12	12	12	12	12	12
s by w	0.02	0.04	0.06	0.08	0.10	0.12	0.14	0.16	0.18	0.20	0.22
ss w	0.03	0.07	0.12	0.16	0.20	0.25	0.29	0.34	0.38	0.42	0.45
sw by s	0.05	0.12	0.19	0.25	0.32	0.39	0.46	0.54	1.01	1.08	1.11
s w	0.08	0.18	0.29	0.38	0.49	0.59	1.10	1.21	1.33	1.43	1.51
sw by w	0.12	0.27	0.42	0.57	1.13	1.29	1.46	2.04	2.23	2.40	2.54
w s w	0.16	0.43	1.08	1.33	2.00	2.28	3.00	3.36	4.24	5.24	
w by s	0.40	1.30	2.22	3.22	4.43						
West	6.00										
☉ set.	6.00	6.00	6.00	5.59	5.59	5.58	5.58	5.58	5.57	5.57	5.54



A Sun-Dial for the Latitude of 3 Degrees.

North Declination

o d		2 d	5 d	7 d	10 d	12 d	15 d	17 d	20 d	22 d	23 d
o m		30m		30m		30m		30m			30m
h m	Point	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
12	North	12	12	12	0 m	12	12	12	12	12	12
0.02	n by w	Zen. West.	0.02	0.04	0.06	0.08	0.10	0.12	0.14	0.16	0.18
0.05	n n w		0.03	0.07	0.12	0.16	0.21	0.25	0.30	0.34	0.37
0.08	n w by n		0.05	0.12	0.19	0.26	0.33	0.40	0.48	0.54	0.59
0.12	n w		0.08	0.19	0.29	0.35	0.50	1.01	1.13	1.23	1.31
0.18	n w b w		0.12	0.27	0.43	0.59	1.16	1.34	1.54	2.10	2.24
0.29	w n w		0.20	0.45	1.11	1.39	2.11	2.47	3.33	4.31	
0.59	w by n		0.42	1.40	2.57						
6.00											
6.00	☉ fet.	6.00	6.01	6.01	6.02	6.02	6.03	6.04	6.04	6.05	6.05
d.m.	Sun's	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	8d.m.	d.m.
0.00	Amp.	2.30	5.00	7.30	10.1	12.31	15.1	17.31	20.2	22.2	23.32

South Declination.

Deg.		2 d	5 d	7 d	10 d	12 d	15 d	17 d	20 d	22 d	23 d
Min.		30m		30m		30m		30m			30m
Point.	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South	12	12	12	12	12	12	12	12	12	12	12
s by w	0.02	0.04	0.06	0.08	0.10	0.13	0.15	0.17	0.19	0.21	0.22
s s w	0.05	0.09	0.13	0.18	0.22	0.26	0.31	0.35	0.40	0.44	0.47
sw by s	0.08	0.15	0.21	0.28	0.35	0.42	0.49	0.56	1.04	1.10	1.15
s w	0.12	0.22	0.32	0.42	0.53	1.03	1.14	1.25	1.37	1.47	1.55
sw b w	0.18	0.33	0.48	1.03	1.19	1.35	1.52	2.10	2.30	2.46	3.00
w s w	0.29	0.53	1.17	1.42	2.09	2.37	3.08	3.43	4.31	5.29	
w by s	0.55	1.48	2.40	3.38	4.55						
West.	6.00										
☉ fet.	6.00	6.00	5.59	5.59	5.58	5.58	5.56	5.56	5.56	5.55	5.55

*A Sun-Dial for the Latitude of 4 Degrees.*

## North Declination.

Deg.	2 d	5 d	7 d	10 d	12 d	15 d	17 d	20 d	22 d	23 d
Min.	30m		30m		30m		30m			30m
Point.	h m	Point.	h m	h m	h m	h m	h m	h m	h m	h m
South	12	North	12	12	12	12	12	12	12	12
s by w	0.01	n by w	0.01	0.03	0.05	0.07	0.09	0.11	0.13	0.15
s s w	0.02	n n w	0.02	0.06	0.10	0.14	0.19	0.23	0.28	0.32
sw by s	0.04	nw b n	0.03	0.09	0.16	0.23	0.30	0.38	0.45	0.52
s w	0.06	n w	0.04	0.14	0.21	0.35	0.46	0.57	1.09	1.19
sw bw	0.09	nwb w	0.05	0.21	0.37	0.53	1.10	1.28	1.47	2.04
w s w	0.14	w n w	0.10	0.35	1.01	1.29	2.00	2.36	3.21	4.17
w by s	0.29	w by n	0.21	1.17	2.29					
West.	3.25									
☉ fet.	6.00	☉ fet.	6.01	6.02	6.03	6.03	6.04	6.05	6.06	6.06
Sun's	d.m.	Sun's	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.
Amp.	2.30	Amp.	15 00	7.31	10.1	12.31	15.1	17.32	20.3	22.3
										23.34

## South Declination.

Deg.	0 d	2 d	5 d	7 d	10 d	12 d	15 d	17 d	20 d	22 d	23 d
Min.		30m		30m		30m		30m			30m
Point.	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South	12	12	12	12	12	12	12	12	12	12	12
s by w	0.03	0.05	0.07	0.09	0.11	0.13	0.16	0.18	0.20	0.22	0.23
s s w	0.07	0.11	0.15	0.19	0.23	0.28	0.32	0.36	0.41	0.45	0.48
sw by s	0.11	0.17	0.24	0.31	0.38	0.45	0.52	0.59	1.07	1.13	1.18
s w	0.16	0.26	0.36	0.46	0.57	1.07	1.18	1.29	1.41	1.51	1.59
sw bw	0.24	0.39	0.54	1.09	1.25	1.41	1.58	2.16	2.35	2.52	3.55
w s w	0.38	1.02	1.26	1.51	2.17	2.45	3.17	3.52	4.38	5.33	
w by s	1.17	2.05	2.55	3.51	5.03						
West.	6.00										
☉ fet.	6.00	6.00	5.59	5.58	5.57	5.57	5.56	5.55	5.54	5.54	5.53

A Sun-Dial for the Latitude of 5 Degrees.

North Declination

Deg.	2 d		5 d	7	10 d	12 d	15 d	17 d	20 d	22 d	23 d
Min.	30m			30m		30m		30m			30m
Point.	h m	Point	h m	h m	h m	h m	h m	h m	h m	h m	h m
South	12	North	12	12	12	12	12	12	12	12	12
s by w	0.02	n by w	Zen. West.	0.02	0.04	0.06	0.08	0.10	0.12	0.14	0.16
s s w	0.04	n n w		0.04	0.08	0.13	0.17	0.22	0.26	0.30	0.33
sw by s	0.07	nw by n		0.07	0.14	0.21	0.28	0.35	0.43	0.49	0.54
s w	0.10	nw		0.10	0.20	0.31	0.42	0.53	1.05	1.15	1.22
swbw	0.19	nwb w		0.15	0.31	0.47	1.04	1.21	1.40	1.57	2.10
w s w	0.24	w n w		0.25	0.51	1.18	1.49	2.24	3.08	4.00	
w by s	0.48	w by n		0.54	2.01						
West.	4.00										
☉ fet.	6.01	☉ fet.	6.02	6.03	6.04	6.04	6.05	6.06	6.07	6.08	6.09
Sun's	d.m.	Sun's	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	3d.m
Amp.	2.30	Amp.	5.01	7.31	10.2	12.32	15.3	17.34	20.5	22.5	23.26

South Declination.

Deg.	0 d	2 d	5 d	7 d	10 d	12 d	15 d	17 d	20 d	22 d	23 d
Min.		30m		30m		30m		30m			30m
Point.	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South	12	12	12	12	12	12	12	12	12	12	12
s by w	0.04	0.06	0.08	0.10	0.12	0.14	0.16	0.18	0.20	0.22	0.24
s s w	0.08	0.12	0.17	0.21	0.25	0.29	0.34	0.38	0.43	0.47	0.50
sw by s	0.13	0.20	0.27	0.33	0.40	0.47	0.54	1.02	1.09	1.16	1.21
s w	0.20	0.30	0.40	0.50	1.00	1.11	1.22	1.33	1.45	1.55	2.02
swbw	0.30	0.45	1.00	1.15	1.34	1.46	2.03	2.21	2.40	2.56	3.11
w s w	0.48	1.11	1.35	2.00	2.26	2.53	3.24	3.59	4.43	5.35	
w by s	1.35	2.21	3.09	4.03	5.11						
West.	6.00										
☉ fet.	6.00	5.59	5.58	5.57	5.56	5.56	5.55	5.54	5.53	5.52	5.51

*A Sun-Dial for the Latitude of 6 Degrees.*

## North Declination.

Deg.	2 d	5 d		7 d	10 d	12 d	15 d	17 d	20 d	22 d	23 d
Min.	30m			30m		30m		30m			30m
Point.	h m	h m	h m	Point.	h m	h m	h m	h m	h m	h m	h m
South	12	12		North	12	12	12	12	12	12	12
s by w	0.03	0.01	n by w	0.01	0.03	0.05	0.07	0.09	0.11	0.13	0.15
s s w	0.06	0.02	n n w	0.03	0.07	0.11	0.15	0.20	0.24	0.28	0.31
sw by s	0.09	0.03	nw b n	0.04	0.11	0.18	0.25	0.32	0.40	0.46	0.51
s w	0.14	0.04	n w	0.06	0.16	0.27	0.38	0.49	1.01	1.10	1.18
sw b w	0.21	0.06	nwb w	0.09	0.25	0.41	0.57	1.15	1.34	1.50	2.04
w s w	0.33	0.10	w n w	0.15	0.40	1.08	1.38	2.12	2.55	3.44	
w by s	1.06	0.20	w by n	0.32	1.34	3.24					
West.	4.22	2.15									
☉ fet.	6.01	6.02	☉ fet.	6.03	6.04	6.05	6.06	6.07	6.09	6.10	6.11
Sun's	d.m.	d.m.	Sun's	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.
Amp.	2.30	5.01	Amp.	7.32	10.3	12.34	15.5	17.36	20.6	22.7	23.35

## South Declination.

Deg.	0 d	2 d	5 d	7 d	10 d	12 d	15 d	17 d	20 d	22 d	23 d
Min.		30m		30m		30m		30m			30m
Point.	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South	12	12	12	12	12	12	12	12	12	12	12
s by w	0.05	0.07	0.09	0.11	0.13	0.15	0.17	0.19	0.21	0.23	0.24
s s w	0.10	0.14	0.18	0.22	0.27	0.31	0.35	0.40	0.44	0.48	0.51
sw by s	0.16	0.23	0.29	0.36	0.43	0.50	0.57	1.04	1.12	1.18	1.23
s w	0.24	0.34	0.44	0.50	1.04	1.15	1.25	1.37	1.48	1.58	2.06
sw b w	0.36	0.50	1.05	1.20	1.36	1.52	2.08	2.26	2.45	3.02	3.15
w s w	0.57	1.20	1.44	2.08	2.34	3.01	3.31	4.06	4.48	5.37	
w by s	1.51	2.35	3.22	4.13	5.16						
West.	6.00										
☉ fet.	6.00	5.59	5.58	5.57	5.56	5.55	5.54	5.53	5.51	5.50	5.49



A Sun Dial for the Latitude of 7 Degrees.

North Declination.

Deg.	2 d	5 d		7 d	10 d	12 d	15 d	17 d	20 d	22 d	23 d
Min.	30m			30m		30m		30m			30m
Point.	h	m	h m	Point.	h	m	h m	h	m	h m	h m
South	12	12		North	12	12	12	12	12	12	12
s by w	0.04	0.02	n by w	0.00	0.02	0.04	0.07	0.09	0.11	0.13	0.14
s s w	0.07	0.03	n n w	0.01	0.05	0.09	0.14	0.18	0.23	0.27	0.30
s w by s	0.12	0.05	n w b n	0.01	0.08	0.15	0.22	0.29	0.36	0.44	0.48
s w	0.18	0.08	n w	0.02	0.12	0.23	0.33	0.45	0.56	1.06	1.14
s w b w	0.27	0.12	n w b w	0.03	0.18	0.34	0.51	1.08	1.27	1.43	1.57
w s w	0.43	0.19	w n w	0.05	0.30	0.57	1.27	2.00	2.42	3.28	
w by s	1.23	0.39	w by n	1.10	0.08	2.36					
West	4.37	2.58									
☉ fet.	6.01	6.02	☉ fet.	6.03	6.05	6.06	6.08	6.09	6.10	6.11	6.12
Sun's	d.m.	d.m.	Sun's	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.
Amp.	2.31	5.02	Amp.	7.33	10.41	12.35	15.7	17.38	20.9	22.10	23.42

South Declination.

Deg.	0 d	2 d	5 d	7 d	10 d	12 d	15 d	17 d	20 d	22 d	23 d	
Min.		30m		30m		30m		30m			30m	
Point	h	m	h	m	h	m	h	m	h	m	h	m
South	12	12	12	12	12	12	12	12	12	12	12	
s by w	0.06	0.07	0.09	0.11	0.13	0.16	0.18	0.20	0.22	0.24	0.25	
s s w	0.12	0.16	0.20	0.24	0.28	0.33	0.37	0.41	0.46	0.50	0.53	
s w by s	0.19	0.25	0.32	0.39	0.45	0.52	0.59	1.07	1.13	1.21	1.25	
s w	0.28	0.38	0.48	0.58	1.08	1.18	1.29	1.40	1.52	2.02	2.09	
s w b w	0.41	0.56	1.11	1.26	1.41	1.57	2.14	2.31	2.50	3.06	3.19	
w s w	1.06	1.29	1.52	2.16	2.41	3.08	3.38	4.22	4.53	5.39		
w by s	2.06	2.49	3.33	4.22	5.20							
West.	6.00											
☉ fet.	6.00	5.59	5.58	5.57	5.55	5.54	5.52	5.51	5.50	5.49	5.48	

*A Sun Dial for the Latitude of 8 Degrees.*

## North Declination.

Deg.	2 d	5 d	7 d	10 d	12 d	15 d	17 d	20 d	22 d	23 d
Min.	30m		30m		30m		30m			30m
Point.	h m	h m	h m	Point.	h m	h m	h m	h m	h m	h m
South	12	12	12	North	12	12	12	12	12	12
s by w	0.04	0.02	0.00	n by w	0.02	0.04	0.06	0.08	0.10	0.13
s s w	0.09	0.05	0.01	n n w	0.03	0.08	0.12	0.17	0.21	0.28
s w by s	0.15	0.08	0.01	n w b n	0.05	0.12	0.20	0.27	0.34	0.45
s w	0.22	0.12	0.02	n w	0.08	0.18	0.29	0.40	0.52	0.69
s w b w	0.33	0.18	0.03	n w b w	0.12	0.28	0.43	1.00	1.12	1.47
w s w	0.52	0.29	0.05	w n w	0.20	0.46	1.16	1.48	2.28	4.07
w by s	1.39	0.56	0.10	w by n	0.44	1.59				
West	4.48	3.36	1.22							
☉ fet.	6.01	6.03	6.04	☉ fet.	6.06	6.07	6.09	6.10	6.12	6.14
Sun's	d.m.	d.m.	d.m.	Sun's	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.
Amp.	2.31	5.02	7.34	Amp.	10.6	12.37	15.9	17.40	20.12	23.46

## South Declination.

Deg	0 d	2 d	5 d	7 d	10 d	12 d	15 d	17 d	20 d	22 d	23 d
Min.		30m		30m		30m		30m			30m
Point	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South	12	12	12	12	12	12	12	12	12	12	12
s by w	0.06	0.08	0.10	0.12	0.14	0.16	0.18	0.21	0.23	0.25	0.26
s s w	0.13	0.17	0.21	0.26	0.30	0.34	0.38	0.43	0.47	0.51	0.54
s w by s	0.21	0.28	0.34	0.41	0.48	0.55	1.02	1.09	1.17	1.23	1.28
s w	0.32	0.41	0.51	1.01	1.11	1.22	1.33	1.44	1.55	2.05	2.13
s w b w	0.47	1.02	1.16	1.31	1.46	2.02	2.17	2.35	2.53	3.09	3.22
w s w	1.14	1.37	2.00	2.24	2.48	3.15	3.44	4.17	4.56	5.39	
w by s	2.20	3.01	3.44	4.26	5.24						
West	6.00										
☉ fet.	6.00	5.59	5.57	5.56	5.54	5.53	5.51	5.50	5.48	5.47	5.46

A Sun-Dial for the Latitude of 9 Degrees.

North Declination

Deg.	2 d	5 d	7 d		10 d	12 d	15 d	17 d	20 d	22 d	23 d
Min.	30m		30m			30m		30m			30m
Point.	h m	h m	h m	Point	h m	h m	h m	h m	h m	h m	h m
South	12	12	12	North	12	12	12	12	12	12	12
s by w	0.05	0.03	0.01	n by w	0.01	0.03	0.05	0.07	0.09	0.11	0.12
s s w	0.11	0.07	0.03	n n w	0.02	0.06	0.10	0.14	0.19	0.23	0.26
sw by s	0.17	0.11	0.04	nw by n	0.03	0.10	0.17	0.24	0.31	0.38	0.43
s w	0.26	0.16	0.06	n w	0.04	0.14	0.25	0.36	0.47	0.57	1.05
s w b w	0.38	0.24	0.09	n w b w	0.06	0.22	0.38	0.55	1.14	1.30	1.42
w s w	1.00	0.38	0.14	w n w	0.10	0.36	1.04	1.36	2.15	2.55	3.42
w by s	1.53	1.13	0.29	w by n	0.21	1.27					
West.	4.56	3.46	2.15								
☉ set.	6.01	6.03	6.04	☉ set.	6.06	6.08	6.10	6.12	6.14	6.15	6.16
Sun's	d.m.	d.m.	d.m.	Sun's	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.
Amp.	2.31	5.03	7.35	Amp.	10.71	12.39	15.11	17.43	20.16	22.18	23.50

South Declination.

Deg.	0 d	2 d	5 d	7 d	10 d	12 d	15 d	17 d	20 d	22 d	23 d
Min.		30m		30m		30m		30m			30m
Point.	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South	12	12	12	12	12	12	12	12	12	12	12
s by w	0.07	0.09	0.11	0.13	0.15	0.17	0.19	0.21	0.24	0.25	0.27
s s w	0.15	0.19	0.23	0.27	0.31	0.36	0.40	0.44	0.49	0.54	0.56
sw by s	0.24	0.30	0.37	0.44	0.50	0.57	1.04	1.12	1.19	1.25	1.31
s w	0.36	0.45	0.55	1.05	1.15	1.26	1.36	1.47	1.59	2.09	2.16
sw b w	0.53	1.07	1.22	1.36	1.52	2.07	2.24	2.41	2.59	3.15	3.28
w s w	1.23	1.45	2.08	2.31	2.55	3.21	3.50	4.22	5.00	5.40	
w by s	2.33	3.12	3.53	4.36	5.27						
West.	6.00										
☉ set.	6.00	5.59	5.57	5.56	5.54	5.52	5.50	5.48	5.46	5.45	5.44

## A Sun-Dial for the Latitude of 10 Degrees.

## North Declination.

Deg.	2 d	5 d	7 d	10 d		12 d	15 d	17 d	20 d	22 d	23 d	
Min.	30m		30m			30m		30m			30m	
Point.	h	m	h	m	h	m	h	m	h	m	h	m
South	12	12	21	12	North	12	12	12	12	12	12	
s by w	0.06	0.04	0.02		n by w	0.02	0.04	0.06	0.08	0.10	0.12	
s w	0.12	0.08	0.04		n n w	0.04	0.09	0.13	0.18	0.21	0.24	
sw by s	0.20	0.13	0.07		n w b n	0.07	0.14	0.21	0.29	0.35	0.40	
s w	0.30	0.17	0.10		n w	0.10	0.21	0.32	0.43	0.53	1.00	
sw b w	0.44	0.30	0.15		n w b w	0.15	0.32	0.49	1.06	1.23	1.35	
w s w	1.09	0.47	0.24		w n w	0.25	0.53	1.24	2.01	2.39	3.19	
w by s	2.07	1.28	0.47		w by n	0.55	1.07					
West.	5.03	4.01	2.47									
☉ set.	6.02	6.04	6.05	6.07	☉ set.	6.09	6.11	6.13	6.15	6.17	6.18	
Sun's	d.m.	d.m.	d.m.	d.m.	Sun's	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	
Amp.	2.32	5.05	7.37	10.10	Amp.	12.42	15.15	17.47	20.10	22.12	23.54	

## South Declination.

Deg.	0 d	2 d	5 d	7 d	10 d	12 d	15 d	17 d	20 d	22 d	23 d	
Min.		30m		30m		30m		30m			30m	
Point	h	m	h	m	h	m	h	m	h	m	h	m
South	12	12	12	12	12	12	12	12	12	12	12	
s by w	0.08	0.10	0.12	0.14	0.16	0.18	0.20	0.22	0.24	0.26	0.27	
s s w	0.16	0.21	0.25	0.29	0.33	0.37	0.42	0.46	0.51	0.54	0.57	
sw by s	0.26	0.33	0.40	0.46	0.53	1.00	1.07	1.14	1.22	1.28	1.33	
s w	0.39	0.49	0.56	1.09	1.19	1.29	1.40	1.51	2.02	2.12	2.19	
sw b w	0.58	1.13	1.27	1.42	1.57	2.12	2.28	2.45	3.03	3.19	3.32	
w s w	1.31	1.53	2.15	2.38	3.02	3.27	3.55	4.26	5.03	5.41		
w by s	2.44	3.22	4.01	4.42	5.29							
West.	6.00											
☉ set.	6.00	5.58	5.56	5.55	5.52	5.51	5.46	5.47	5.45	5.43	5.42	



A Sun-Dial for the Latitude of 11 Degrees:

North Declination.

Deg.	2 d	5 d	7 d	10 d		12 d	15 d	17 d	20 d	22 d	23 d
Min.	30m		30m			30m		30m			30m
Point.	h m	h m	h m	h m	Point.	h m	h m	h m	h m	h m	h m
South	12	12	12	12	North	12	12	12	12	12	12
s by w	0.07	0.05	0.03	0.01	n by w	0.01	0.03	0.05	0.07	0.09	0.11
ss w	0.14	0.10	0.06	0.02	n n w	0.02	0.07	0.11	0.16	0.20	0.22
sw by s	0.21	0.16	0.11	0.03	n w by n	0.04	0.11	0.18	0.26	0.34	0.43
s w	0.34	0.24	0.14	0.04	n w	0.06	0.17	0.28	0.39	0.42	0.56
sw by w	0.50	0.35	0.21	0.06	n w by w	0.09	0.25	0.42	1.00	1.15	1.28
w s w	1.17	0.56	0.33	0.08	w n w	0.15	0.41	1.12	1.47	2.23	2.59
w by s	2.19	1.43	1.03	0.20	w by n	0.33	1.55				
West.	5.08	4.13	3.09	2.19							
☉ set.	6.02	6.04	6.06	6.08	☉ set.	6.10	6.12	6.14	6.16	6.18	6.19
Sun's d.m.	d.m.	d.m.	d.m.	d.m.	Sun's d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.
Amp.	2.32	5.05	7.38	10.11	Amp.	12.44	15.17	17.50	20.24	22.27	23.5

South Declination.

Deg.	0 d	2 d	5 d	7 d	10 d	12 d	15 d	17 d	20 d	22 d	23 d
Min.		30m		30m		30m		30m			30m
Point.	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South	12	12	12	12	12	12	12	12	12	12	12
s by w	0.09	0.11	0.13	0.15	0.17	0.19	0.21	0.23	0.25	0.27	0.28
ss w	0.18	0.22	0.26	0.30	0.34	0.39	0.43	0.47	0.52	0.56	0.59
sw by s	0.29	0.37	0.42	0.49	0.55	1.02	1.09	1.16	1.24	1.30	1.35
s w	0.43	0.53	1.03	1.12	1.22	1.33	1.43	1.54	2.05	2.15	2.22
sw by w	1.04	1.18	1.32	1.47	2.01	2.17	2.33	2.49	3.07	3.23	3.35
w s w	1.39	2.01	2.22	2.45	3.10	3.33	4.00	4.30	5.05	5.41	
w by s	2.55	3.31	4.08	4.47	5.31						
West	6.00										
☉ set.	6.20	5.58	5.56	5.54	5.52	5.50	5.48	5.46	5.44	5.42	5.41

## A Sun Dial for the Latitude of 12 Degrees.

## North Declination.

Deg.	2 d	5 d	7 d	10 d		12 d	15 d	17 d	20 d	22 d	23 d
Min.	30m		30m			30m		30m			30m
Point.	h m	h m	h m	h m	Point.	h m	h m	h m	h m	h m	h m
South	12	12	12	12	North	12	12	12	12	12	12
s by w	0.07	0.06	0.04	0.02	n by w	0.00	0.02	0.04	0.07	0.09	0.10
s s w	0.16	0.12	0.08	0.04	n n w	0.01	0.05	0.10	0.14	0.18	0.21
s w b y s	0.25	0.19	0.12	0.05	n w b n	0.01	0.08	0.15	0.23	0.29	0.34
s w	0.37	0.28	0.18	0.08	n w	0.02	0.12	0.23	0.35	0.44	0.51
s w b w	0.55	0.41	0.27	0.12	n w b w	0.03	0.19	0.33	0.42	1.09	1.21
w s w	1.25	1.04	0.42	0.19	w n w	0.05	0.31	1.00	1.14	2.07	2.40
w by s	2.31	1.56	1.23	0.38	w by n	0.09	1.17				
West	5.13	4.23	3.27	2.16							
☉ fet.	6.02	6.04	6.06	6.09	☉ fet.	6.11	6.13	6.15	6.18	6.20	6.22
Sun's	d.m.	d.m.	d.m.	d.m.	Sun's	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.
Amp.	2.33	5.07	7.39	10.13	Amp.	12.46	15.20	17.55	20.28	22.31	24.5

## South Declination.

Deg.	0 d	2 d	5 d	7 d	10 d	12 d	15 d	17 d	20 d	22 d	23 d
Min.		30m		30m		30m		30m			30m
Point	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South	12	12	12	12	12	12	12	12	12	12	12
s by w	0.09	0.11	0.13	0.15	0.17	0.19	0.21	0.23	0.25	0.27	0.29
s s w	0.20	0.24	0.28	0.32	0.36	0.40	0.44	0.49	0.53	0.57	1.00
s w b y s	0.32	0.38	0.45	0.51	0.58	1.05	1.12	1.19	1.26	1.32	1.37
s w	0.47	0.56	1.06	1.16	1.26	1.36	1.46	1.57	2.08	2.18	2.25
s w b w	1.09	1.23	1.37	1.52	2.06	2.21	2.37	2.51	3.11	3.27	3.39
w s w	1.47	2.07	2.29	2.51	3.14	3.38	4.04	4.33	5.07	5.41	
w by s	3.05	3.39	4.18	4.51	5.32						
West	5.00										
☉ fet.	5.00	5.58	5.56	5.54	5.51	5.49	5.47	5.45	5.42	5.40	5.38

A Sun-Dial for the Latitude of 13 Degrees.

North Declination.

Deg	2 d	5 d	7 d	10 d	12 d		15 d	17 d	20 d	22 d	23 d
Min	30m		30m		30m			30m			30m
Point	h m	h m	h m	h m	h m	Point	h m	h m	h m	h m	h m
South	12	12	12	12	12	North	12	12	12	12	12
s by w	0.08	0.06	0.04	0.02	0.00	n by w	0.02	0.04	0.06	0.08	0.09
ss w	0.17	0.13	0.09	0.05	0.01	n n w	0.03	0.08	0.12	0.16	0.15
sw by s	0.28	0.21	0.15	0.08	0.01	n w b n	0.06	0.13	0.21	0.27	0.31
s w	0.41	0.32	0.22	0.12	0.02	n w	0.08	0.17	0.30	0.40	0.47
sw b w	1.01	0.47	0.32	0.18	0.03	n w b w	0.13	0.25	0.46	1.01	1.13
w s w	1.33	1.12	0.91	0.68	0.05	w n w	0.21	0.49	1.21	1.52	2.22
w by s	2.41	2.08	1.29	0.54	0.10	w by n	0.48				
West.	5.16	4.31	3.39	2.41	1.05						
☉ set	6.02	6.05	6.07	6.09	6.11	☉ set	6.14	6.16	6.19	6.21	6.23
Sun's	d.m.	d.m.	d.m.	d.m.	d.m.	Sun's	d.m.	d.m.	d.m.	d.m.	d.m.
Amp.	2.33	5.08	7.42	10.16	12.49	Amp.	15.24	17.59	20.33	22.37	24.11

South Declination.

Deg.	0 d	2 d	5 d	7 d	10 d	12 d	15 d	17 d	20 d	22 d	23 d
Min.			30m		30m		30m		30m		30m
Point	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South	12	12	12	12	12	12	12	12	12	12	12
s by w	0.10	0.12	0.14	0.16	0.18	0.20	0.22	0.24	0.26	0.28	0.29
ss w	0.21	0.25	0.29	0.33	0.38	0.42	0.46	0.50	0.55	0.59	1.02
sw by s	0.34	0.41	0.47	0.54	1.00	1.07	1.14	1.20	1.28	1.34	1.39
s w	0.51	1.00	1.10	1.19	1.29	1.39	1.50	2.01	2.12	2.21	2.29
sw b w	1.14	1.28	1.42	1.56	2.11	2.26	2.41	2.58	3.15	3.30	3.42
w s w	1.54	2.15	2.36	2.57	3.20	3.43	4.09	4.37	5.09	5.40	
w by s	3.14	3.47	4.20	4.55	5.34						
West	6.00										
☉ set	6.00	5.58	5.55	5.53	5.51	5.49	5.46	5.44	5.41	5.39	5.37

## A Sun Dial for the Latitude of 14 Degrees.

## North Declination.

Deg.	2 d	5 d	7 d	10 d	12 d		15 d	17 d	20 d	22 d	23 d
Min.	30m		30m		30m			30m			30m
Point	h m	h m	h m	h m	h m	Point	h m	h m	h m	h m	h m
South	12	12	12	12	12	North	12	12	12	12	12
s by w	0.09	0.07	0.05	0.03	0.01	n by w	0.01	0.03	0.05	0.07	0.08
s s w	0.19	0.15	0.11	0.07	0.03	n n w	0.02	0.06	0.10	0.14	0.17
s w by s	0.30	0.24	0.17	0.11	0.04	n w b n	0.03	0.10	0.17	0.22	0.28
s w	0.45	0.35	0.26	0.16	0.06	n w	0.04	0.15	0.26	0.35	0.43
s w b w	1.06	0.52	0.38	0.24	0.09	n w b w	0.06	0.22	0.40	0.54	1.06
w s w	1.41	1.20	0.59	0.38	0.13	w n w	0.10	0.37	1.08	1.38	2.05
w by s	2.52	2.19	1.46	1.10	0.29	w by n	0.22	1.48			
West	5.20	4.38	3.52	3.00	1.49						
☉ set.	6.02	6.05	6.07	6.10	6.12	☉ set.	6.15	6.18	6.21	6.23	6.25
Sun's	d.m.	d.m.	d.m.	d.m.	d.m.	Sun's	d.m.	d.m.	d.m.	d.m.	d.m.
Amp.	2.34	5.09	7.44	10.19	12.53	Amp.	15.28	18.3	20.38	22.43	24.17

## South Declination.

Deg.	0 d	2 d	5 d	7 d	10 d	12 d	15 d	17 d	20 d	22 d	23 d
Min.		30m		30m		30m		30m			30m
Point	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South	12	12	12	12	12	12	12	12	12	12	12
s by w	0.11	0.13	0.15	0.17	0.19	0.21	0.23	0.25	0.27	0.29	0.30
s s w	0.23	0.27	0.31	0.35	0.40	0.44	0.48	0.53	0.57	1.01	1.04
s w by s	0.37	0.43	0.50	0.56	1.03	1.10	1.16	1.23	1.31	1.36	1.42
s w	0.54	1.04	1.13	1.23	1.33	1.43	1.53	2.04	2.15	2.24	2.31
s w b w	1.20	1.33	1.47	2.01	2.15	2.30	2.45	3.02	3.19	3.33	3.45
w s w	2.01	2.21	2.42	3.03	3.25	3.48	4.12	4.40	5.11	5.40	
w by s	3.22	3.53	4.25	4.59	5.35						
West	5.00										
☉ set	6.00	5.58	5.55	5.53	5.50	5.48	5.45	5.42	5.39	5.37	5.35



A Sun-Dial for the Latitude of 15 Degrees.

North Declination

Deg.	2 d	5 d	7 d	10 d	12 d		15 d	17 d	20 d	22 d	23 d
Min.	30m		30m		30m			30m			30m
Point.	h m	h m	h m	h m	h m	Point	h m	h m	h m	h m	h m
South	12	12	12	12	12	North	12	12	12	12	12
s by w	0.10	0.08	0.06	0.04	0.02	n by w	0.02	0.04	0.06	0.07	
ss w	0.21	0.16	0.12	0.08	0.04	nn w	0.04	0.09	0.12	0.15	
sw by s	0.33	0.26	0.20	0.13	0.07	nw by n	0.07	0.14	0.20	0.25	
s w	0.49	0.39	0.30	0.20	0.10	n w	0.11	0.22	0.31	0.38	
s w by w	1.11	0.58	0.44	0.37	0.15	nw by w	0.16	0.33	0.47	0.59	
w s w	1.40	1.28	1.08	0.47	0.24	w n w	0.26	0.56	1.24	1.50	
w by s	3.00	2.30	1.58	1.24	0.46	w by n	1.06				
West.	5.22	4.44	4.02	3.15	2.17						
☉ set.	6.02	6.05	6.08	6.11	6.13	☉ set.	6.16	6.15	6.22	6.25	6.27
Sun's d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	Sun's	d.m.	d.m.	d.m.	d.m.	d.m.
Amp	2.35	5.10	7.46	10.21	12.56	Amp.	15.32	18.8	22.44	22.49	24.24

Zen. West.

South Declination.

Deg.	0 d	2 d	5 d	7 d	10 d	12 d	15 d	17 d	20 d	22 d	23 d
Min.		30m		30m		30m		30m			30m
Point.	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South	12	12	12	12	12	12	12	12	12	12	12
s by w	0.12	0.14	0.16	0.18	0.20	0.22	0.24	0.26	0.28	0.30	0.31
ss w	0.24	0.28	0.32	0.36	0.40	0.45	0.49	0.53	0.58	1.01	1.04
sw by s	0.39	0.46	0.52	0.59	1.05	1.12	1.18	1.25	1.33	1.39	1.43
s w	0.58	1.07	1.17	1.26	1.36	1.46	1.56	2.07	2.18	2.27	2.34
sw by w	1.25	1.38	1.52	2.06	2.20	2.34	2.49	3.05	3.22	3.37	3.48
w s w	2.08	2.28	2.48	3.08	3.29	3.52	4.16	4.42	5.12	5.40	
w by s	3.30	4.00	4.30	5.02	5.36						
West.	6.00										
☉ set.	6.00	5.58	5.55	5.52	5.49	5.47	5.44	5.41	5.38	5.35	5.33

## A Sun-Dial for the Latitude of 16 Degrees.

## North Declination.

Deg.	2 d	5 d	7 d	10 d	12 d	15 d		17 d	20 d	22 d	23 d
Min.	30m		30m		30m			30m			30m
Point.	h m	h m	h m	h m	h m	h m	Point.	h m	h m	h m	h m
South	12	12	12	12	12	12	North	12	12	12	12
s by w	0.11	0.09	0.07	0.05	0.03	0.01	n by w	0.01	0.03	0.05	0.07
s s w	0.22	0.18	0.14	0.10	0.06	0.02	n n w	0.03	0.07	0.11	0.14
sw by s	0.35	0.29	0.23	0.16	0.10	0.03	nw b n	0.04	0.09	0.17	0.22
s w	0.52	0.43	0.34	0.25	0.14	0.04	n w	0.06	0.17	0.26	0.33
sw bw	1.16	1.03	0.49	0.35	0.21	0.06	nwb w	0.10	0.26	0.40	0.52
w s w	1.55	1.36	1.16	0.55	0.33	0.10	w n w	0.16	0.44	1.11	1.34
w by s	3.08	2.39	2.09	1.37	1.01	0.20	w by n	0.36			
West.	5.25	4.49	4.11	3.28	2.37	1.23	West.				
☉ fet.	6.03	6.06	6.09	6.12	6.15	6.18	☉ fet.	6.21	6.24	6.27	6.29
Sun's d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	Sun's d.m.	d.m.	d.m.	d.m.	d.m.
Amp.	2.35	5.12	7.48	10.24	13.00	15.37	Amp.	18.13	20.51	22.56	24.32

## South Declination.

Deg.	0 d	2 d	5 d	7 d	10 d	12 d	15 d	17 d	20 d	22 d	23 d
Min.		30m		30m		30m		30m			30m
Point.	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South	12	12	12	12	12	12	12	12	12	12	12
s by w	0.13	0.14	0.16	0.18	0.20	0.22	0.24	0.26	0.28	0.30	0.32
s s w	0.26	0.30	0.34	0.38	0.42	0.46	0.50	0.55	0.59	1.03	1.06
sw by s	0.42	0.48	0.54	1.01	1.07	1.14	1.21	1.28	1.35	1.41	1.46
s w	1.02	1.11	1.20	1.29	1.39	1.49	1.59	2.10	2.21	2.30	2.37
sw bw	1.30	1.43	1.56	2.10	2.24	2.38	2.53	3.09	3.25	3.40	3.51
w s w	2.15	2.34	2.54	3.14	3.34	3.56	4.19	4.45	5.13	5.40	
w by s	3.37	4.05	4.34	5.04	5.36						
West.	6.00										
☉ fet.	6.00	5.57	5.54	5.51	5.48	5.45	5.42	5.39	5.36	5.33	5.31

# The Mariners Compass Rectified.

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## A Sun Dial for the Latitude of 17 Degrees.

### North Declination.

Deg.	2 d	5 d	7 d	10 d	12 d	15 d		17 d	20 d	22 d	23 d
Min.	30m		30m		30m			30m			30m
Point.	h m	h m	h m	h m	h m	h m	Point	h m	h m	h m	h m
South	12	12	12	12	12	12	North	12	12	12	12
s by w	0.11	0.09	0.07	0.06	0.04	0.02	n by w	0.00	0.02	0.04	0.06
s s w	0.24	0.20	0.16	0.12	0.08	0.03	n n w	0.01	0.05	0.09	0.12
sw by s	0.38	0.32	0.25	0.19	0.13	0.06	n w by n	0.01	0.08	0.15	0.19
s w	0.56	0.47	0.38	0.28	0.19	0.08	n w	0.02	0.13	0.22	0.29
sw by w	1.21	1.08	0.55	0.41	0.27	0.12	n w by w	0.03	0.19	0.33	0.45
w s w	2.02	1.43	1.23	1.03	0.42	0.19	w n w	0.05	0.33	0.58	1.20
w by s	3.16	2.48	2.20	1.49	1.16	0.37	w by n	0.11	1.36		
West.	5.27	4.53	4.18	3.39	2.54	1.55					
w by n					5.50	5.11					
☉ fet.	6.03	5.06	6.09	5.12	6.15	6.19	☉ fet.	6.22	6.25	6.28	6.31
Sun's	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	Sun's	d.m.	d.m.	d.m.	d.m.
Amp.	2.36	5.13	7.50	10.28	13.37	25.42	Amp.	18.19	22.57	23.4	24.40

### South Declination.

Deg.	0 d	2 d	5 d	7 d	10 d	12 d	15 d	17 d	20 d	22 d	23 d
Min.		30m		30m		30m		30m			30m
Poin	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South	12	12	12	12	12	12	12	12	12	12	12
s by w	0.13	0.15	0.17	0.19	0.21	0.23	0.25	0.27	0.29	0.31	0.33
s s w	0.28	0.32	0.36	0.39	0.43	0.47	0.52	0.56	1.01	1.04	1.07
sw by s	0.44	0.50	0.57	1.03	1.09	1.16	1.23	1.30	1.37	1.43	1.47
s w	1.05	1.14	1.24	1.33	1.42	1.51	2.06	2.13	2.2	2.32	2.39
sw by w	1.35	1.48	2.01	2.14	2.28	2.42	2.57	3.12	3.25	3.42	3.54
w s w	2.21	2.40	2.59	3.18	3.39	4.00	4.22	4.47	5.14	5.39	
w by s	3.43	4.10	4.38	5.07	5.37						
West	6.00										
☉ fet.	6.00	5.57	5.54	5.51	5.48	5.45	5.41	5.38	5.35	5.32	5.29

*A Sun-Dial for the Latitude of 18 Degrees.*

## North Declination.

Deg.	2 d	5 d	7 d	10 d	12 d	15 d	17 d	20 d	22 d	23 d
Min.	30m		30m		30m		30m			30m
Point	h m	h m	h m	h m	h m	h m	h m	Point	h m	h m
South	12	12	12	12	12	12	12	North	12	12
s by w	0.12	0.10	0.08	0.06	0.04	0.02	0.00	n by w	0.02	0.03
ss w	0.25	0.21	0.17	0.13	0.09	0.05	0.01	n n w	0.04	0.07
sw by s	0.40	0.34	0.28	0.21	0.15	0.09	0.01	nw b n	0.06	0.12
s w	1.00	0.50	0.41	0.32	0.22	0.12	0.02	n w	0.09	0.17
sw bw	1.26	1.13	1.00	0.47	0.34	0.18	0.03	nwb w	0.13	0.27
w s w	2.08	1.50	1.31	1.11	0.51	0.29	0.05	w n w	0.21	0.45
w by s	3.23	2.57	2.29	2.00	1.29	0.53	0.10	w by n	0.53	
West.	5.29	4.57	4.24	3.49	3.08	2.18	0.56			
w by n					5.51	5.15	4.32			
☉ fet.	6.02	6.06	6.05	5.13	6.16	5.20	6.23	☉ fet.	6.27	6.30
Sun's	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	Sun's	d.m.	d.m.
Amp.	2.37	15	7.55	10.31	13.9	15.47	18.26	Amp.	21.43	1 22 48

## South Declination.

Deg.	0 d	2 d	5 d	7 d	10 d	12 d	15 d	17 d	20 d	22 d	23 d
Min.		30m		30m		30m		30m			30m
Point	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South	12	12	12	12	12	12	12	12	12	12	12
s by w	0.14	0.16	0.18	0.20	0.22	0.24	0.26	0.28	0.30	0.32	0.33
ss w	0.29	0.33	0.37	0.41	0.45	0.49	0.53	0.58	1.02	1.06	1.08
sw by s	0.47	0.53	0.59	1.05	1.12	1.18	1.25	1.32	1.39	1.45	1.50
s w	1.09	1.18	1.27	1.36	1.46	1.55	2.05	2.15	2.26	2.35	2.42
swbw	1.39	1.52	2.05	2.18	2.32	2.44	3.00	3.15	3.31	3.45	3.56
w s w	2.27	2.45	3.04	3.23	3.43	4.03	4.25	4.49	5.15	5.39	
w by s	3.49	4.15	4.41	5.09	5.38						
West.	6.00										
☉ fet.	6.00	5.58	5.54	5.51	5.47	5.44	5.40	5.37	5.33	5.30	5.27



A Sun-Dial for the Latitude of 19 Degrees.

North Declination.

Deg.	2 d	5 d	7 d	10 d	12 d	15 d	17 d	20 d	22 d	23 d			
Min.	30m		30m		30m		30m			30m			
Point	h	mh	mh	mh	mh	mh	mh	m	Point.	h	mh	mh	m
South	12	12	12	12	12	12	12	North	12	12	12		
s by w	0.13	0.11	0.09	0.77	0.05	0.03	0.01	n by w	0.01	0.03	0.04		
s s w	0.27	0.23	0.19	0.15	0.11	0.07	0.03	n n w	0.52	0.05	0.08		
s w by s	0.43	0.37	0.30	0.24	0.18	0.11	0.05	n w by n	0.03	0.09	0.13		
s w	1.03	0.55	0.45	0.36	0.27	0.17	0.07	n w	0.04	0.13	0.20		
swbw	1.35	1.18	1.05	0.52	0.38	0.24	0.09	nwbw	0.76	0.20	0.31		
ws w	2.15	1.57	1.38	1.19	0.59	0.41	0.15	w n w	0.17	0.33	0.53		
w by s	3.29	3.04	2.38	2.09	1.41	1.08	0.29	w by n	0.23				
West	5.31	5.01	4.30	3.57	3.20	2.36	1.35						
w by r					5.52	5.17	4.40						
☉ set.	6.03	6.07	6.10	6.14	6.17	6.21	6.24	☉ set.	6.28	6.31	6.34		
Sun's	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	Sun's	d.m.	d.m.	d.m.		
Amp.	2.38	5.17	7.56	10.35	13.14	15.53	18.33	Amp.	21.12	23.20	24.58		

South Declination.

Deg.	0 d	2 d	5 d	7 d	10 d	12 d	15 d	17 d	20 d	22 d	23 d
Min.		30m		30m		30m		30m			30m
Point	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South	12	12	12	12	12	12	12	12	12	12	12
s by w	0.15	0.17	0.19	0.21	0.23	0.24	0.27	0.29	0.31	0.32	0.34
s s w	0.31	0.35	0.38	0.42	0.45	0.50	0.54	0.58	1.03	1.07	1.09
s w by s	0.49	0.55	1.01	1.08	1.14	1.21	1.27	1.33	1.41	1.47	1.51
s w	1.12	1.21	1.30	1.39	1.48	1.58	2.07	2.16	2.29	2.37	2.44
swbw	1.44	1.57	2.05	2.23	2.36	2.45	3.04	3.19	3.34	3.48	3.58
w s w	2.33	2.51	3.05	3.27	3.46	4.06	4.25	4.51	5.16	5.39	
w by s	4.54	4.19	4.44	5.10	5.39						
West.	6.00										
☉ set	6.00	5.57	5.53	5.50	5.46	5.43	5.39	5.36	5.32	5.29	5.26

*A Sun-Dial for the Latitude of 20 Degrees.*

## North Declination.

Deg.	2 d	5 d	7 d	10 d	12 d	15 d	17 d		20 d	22 d	23 d
Min.	30m		30m		30m		30m				30m
Point.	h m	h m	h m	h m	h m	h m	h m	Point.	h m	h m	h m
South	12	12	12	12	12	12	12	North	12	12	12
s by w	0.14	0.12	0.10	0.08	0.06	0.04	0.02	n by w		0.02	0.03
s s w	0.28	0.25	0.21	0.17	0.13	0.09	0.05	n n w		0.04	0.06
sw by s	0.45	0.39	0.33	0.23	0.20	0.14	0.07	nw by n		0.06	0.10
s w	1.07	0.58	0.49	0.40	0.30	0.21	0.11	n w		0.09	0.16
swbw	1.36	1.23	1.10	0.58	0.44	0.30	0.15	nwbw		0.13	0.24
w s w	2.21	2.03	1.45	1.26	1.07	0.46	0.24	w n w		0.22	0.40
w by s	3.37	3.11	2.45	2.20	1.52	1.21	0.45	w by n			
West	5.32	5.04	4.35	4.00	3.30	2.50	2.00				
w by n					5.54	5.23	4.47				
☉ fet.	6.03	6.27	6.11	6.15	6.18	6.22	6.26	☉ fet.	6.30	6.33	6.36
Sun's	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	Sun's	d.m.	d.m.	d.m.
Amp.	2.40	5.20	7.59	10.39	13.19	16.0	18.45	Amp.	21.20	23.29	25.8

## South Declination.

Deg.	0 d	2 d	5 d	7 d	10 d	12 d	15 d	17 d	20 d	22 d	23 d
Min.		30m		30m		30m		30m			30m
Point	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South	12	12	12	12	12	12	12	12	12	12	12
s by w	0.16	0.17	0.19	0.21	0.23	0.25	0.27	0.29	0.31	0.33	0.34
s s w	0.32	0.36	0.40	0.44	0.48	0.52	0.56	1.00	1.05	1.08	1.11
sw by s	0.51	0.58	1.04	1.10	1.12	1.23	1.29	1.36	1.43	1.49	1.53
s w	1.16	1.24	1.33	1.42	1.51	2.01	2.10	2.20	2.31	2.40	2.47
swbw	1.48	2.01	2.14	2.26	2.39	2.53	3.07	3.25	3.37	3.56	4.00
w s w	2.38	2.56	3.13	3.31	3.50	4.09	4.30	4.52	5.16	5.38	
w by s	3.59	4.23	4.47	5.12	5.38						
West	6.00										
☉ fet.	6.00	5.57	5.53	5.49	5.45	5.42	5.38	5.34	5.30	5.27	5.24

A Sun-Dial for the Latitude of 21 Degrees.

North Declination.

Deg.	2 d	5 d	7 d	10 d	12 d	15 d	17 d	20 d		22 d	23 d
Min.	30m		30m		30m		30m			30m	
Point	h m h	m h m	m h m	m h m	m h m	m h m	m h m	m h m	Point.	h m h	m h m
South	12	12	12	12	12	12	12	12	North	12	12
s by w	0.14	0.13	0.11	0.09	0.07	0.05	0.03	0.01	n by w	0.01	0.02
s s w	0.30	0.26	0.22	0.18	0.14	0.10	0.06	0.02	n n w	0.02	0.04
s w by s	0.48	0.42	0.35	0.29	0.23	0.16	0.10	0.03	n w by n	0.03	0.07
s w	1.10	1.01	0.52	0.43	0.34	0.26	0.15	0.04	n w	0.04	0.11
s w b w	1.40	1.27	1.16	1.03	0.49	0.36	0.21	0.06	n w b w	0.06	0.17
w s w	2.26	2.05	1.52	1.29	1.15	0.55	0.39	0.10	w n w	0.11	0.40
w by s	3.41	3.18	2.54	2.29	2.03	1.33	1.00	0.20	w by n	0.24	
West	5.34	5.07	4.40	4.11	3.39	3.03	2.19	4.14			
w by n					5.55	5.26	4.53	4.12			
☉ fet.	5.04	6.08	6.12	6.16	6.20	6.25	6.28	6.32	☉ fet.	6.35	6.38
Sun's	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	Sun's	d.m.	d.m.
Amp.	2.41	5.21	8.02	10.43	13.24	16.6	18.47	21.29	Amp.	23.40	25.18

South Declination.

Deg.	0 d	2 d	5 d	7 d	10 d	12 d	15 d	17 d	20 d	22 d	23 d
Min.		30m		30m		30m		30m		30m	
Point	h m h	m h m	m h m	m h m	m h m	m h m	m h m	m h m	h m h	m h m	m h m
South	12	12	12	12	12	12	12	12	12	12	12
s by w	0.16	0.18	0.20	0.22	0.24	0.26	0.28	0.30	0.32	0.34	0.35
s s w	0.34	0.38	0.41	0.45	0.49	0.54	0.58	1.02	1.06	1.10	1.11
s w by s	0.54	1.01	1.06	1.12	1.19	1.25	1.32	1.38	1.45	1.51	1.55
s w	1.19	1.28	1.37	1.46	1.55	2.04	2.13	2.23	2.33	2.42	2.45
s w b w	1.53	2.05	2.18	2.30	2.43	2.56	3.10	3.24	3.39	3.52	4.02
w s w	2.43	3.01	3.18	3.35	3.54	4.12	4.32	4.53	5.17		
w by s	4.04	4.27	4.50	5.14	5.39						
West.	6.00										
☉ fet	6.00	5.56	5.52	5.48	5.44	5.40	5.35	5.32	5.28	5.25	5.22

## A Sun-Dial for the Latitude of 22 Degrees.

## North Declination.

Deg.	2 d	5 d	7 d	10 d	12 d	15 d	17 d	20 d	22 d	23 d	
Min.	30m		30m		30m		30m			30m	
Point.	h m	h m	h m	h m	h m	h m	h m	h m	Point.	h m	h m
South	12	12	12	12	12	12	12	12	North	12	12
s by w	0.15	0.13	0.11	0.09	0.08	0.06	0.04	0.02	n by w		0.01
s s w	0.31	0.28	0.24	0.20	0.16	0.12	0.08	0.04	n n w		0.03
sw by s	0.50	0.44	0.42	0.32	0.25	0.19	0.13	0.06	nw by n		0.04
s w	1.14	1.05	0.56	0.47	0.38	0.29	0.19	0.08	n w		0.07
swbw	1.45	1.33	1.20	1.08	0.55	0.41	0.27	0.13	nwbw		0.10
w s w	2.30	2.15	1.58	1.40	1.22	1.03	0.42	0.20	w n w		0.17
w by s	3.46	3.24	3.01	2.39	2.12	1.45	1.14	0.37			
West	5.35	5.10	4.44	4.17	3.47	3.14	2.35	1.43			
w by n					5.56	5.28	4.58	4.21			
☉ set.	6.04	6.08	6.12	6.16	6.20	6.25	6.29	6.34	☉ set.	6.37	6.40
Sun's	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	Sun's	d.m.	d.m.
Amp.	2.42	5.23	8.05	10.48	13.30	16.13	18.55	21.39	Amp.	23.50	25.29

Zen. West.

## South Declination.

Deg.	0 d	2 d	5 d	7 d	10 d	12 d	15 d	17 d	20 d	22 d	23 d
Min.		30m		30m		30m		30m			30m
Point.	h m h m	h m h m	h m h m	h m h m	h m h m	h m h m	h m h m	h m h m	h m h m	h m h m	h m
South	12	12	12	12	12	12	12	12	12	12	12
s by w	0.17	0.19	0.21	0.23	0.25	0.27	0.28	0.30	0.32	0.34	0.35
s s w	0.35	0.39	0.43	0.47	0.51	0.55	0.55	1.03	1.07	1.11	1.13
sw by s	0.56	1.02	1.08	1.14	1.21	1.27	1.33	1.40	1.47	1.52	1.57
s w	1.22	1.31	1.40	1.49	1.58	2.07	2.16	2.25	2.36	2.44	2.51
swbw	1.57	2.09	2.21	2.34	2.46	2.59	3.13	3.27	3.42	3.54	4.04
w s w	2.49	3.05	3.22	3.39	3.57	4.15	4.34	4.55	5.17		
w by s	4.08	4.30	4.52	5.15	5.39						
West	6.00										
☉ set.	6.00	5.56	5.52	5.48	5.44	5.40	5.35	5.31	5.26	5.23	5.20



*A Sun Dial for the Latitude of 23 Degrees.*

North Declination.

Deg.	2 d	5 d	7 d	10 d	12 d	15 d	17 d	20 d	22 d		23 d
Min.	30m		30m		30m		30m				30m
Point.	h m	h m	h m	h m	h m	h m	h m	h m	h m	Point	h m
South	12	12	12	12	12	12	12	12	12	Noth	12
s by w	0.16	0.15	0.13	0.11	0.09	0.07	0.05	0.03	0.01	n by w	0.00
s s w	0.33	0.30	0.26	0.22	0.18	0.14	0.10	0.05	0.02	n n w	0.01
sw by s	0.53	0.47	0.41	0.34	0.28	0.22	0.16	0.09	0.03	nwb n	0.01
s w	1.17	1.08	1.00	0.50	0.41	0.32	0.22	0.13	0.04	n w	0.02
swbw	1.49	1.37	1.25	1.13	1.00	0.47	0.33	0.19	0.06	nwbw	0.03
w s w	2.37	2.21	2.04	1.47	1.29	1.11	0.51	0.29	0.10	w n w	0.06
w by s	3.51	3.30	3.08	2.45	2.21	1.55	1.26	0.59	0.20		
West.	5.36	5.12	4.48	4.22	3.54	3.23	2.48	2.04	1.11		
w by n				6.21	5.57	5.31	5.02	4.29	3.56		
☉ fet	6.04	6.09	6.13	6.17	6.22	6.26	6.31	6.36	6.39	☉ fet	6.43
Sun's	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	Sun's	d.m.
Amp.	2.43	5.26	8.10	10.52	13.36	16.20	19.4	21.49	24.11	Amp.	25.41

South Declination.

Deg.	0 d	2 d	5 d	7 d	10 d	12 d	15 d	17 d	20 d	22 d	23 d
Min.		30m		30m		30m		30m			30m
Point.	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South	12	12	12	12	12	12	12	12	12	12	12
by w	0.18	0.20	0.22	0.24	0.26	0.28	0.30	0.32	0.34	0.35	0.36
s s w	0.37	0.41	0.44	0.48	0.51	0.55	0.59	1.03	1.08	1.12	1.15
sw by s	0.59	1.04	1.10	1.16	1.23	1.29	1.35	1.41	1.49	1.54	1.59
s w	1.25	1.34	1.43	1.51	2.00	2.10	2.19	2.28	2.39	2.46	2.53
swbw	2.01	2.13	2.25	2.37	2.50	3.02	3.16	3.29	3.44	3.56	4.06
w s w	2.53	3.10	3.26	3.43	4.00	4.17	4.36	4.56	5.17		
w by s	4.12	4.33	4.54	5.16	5.39						
West.	6.00										
☉ fet.	6.00	5.56	5.51	5.47	5.43	5.38	5.34	5.29	5.24	5.21	5.17

## A Sun-Dial for the Latitude of 24 Degrees.

## North Declination.

Deg.	2 d	5 d	7 d	10 d	12 d	15 d	17 d	20 d	22 d	23 d
Min.	30m		30m		30m		30m			30m
Point.	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South	12	12	21	12	12	12	12	12	12	12
s by w	0.17	0.15	0.13	0.11	0.09	0.08	0.06	0.04	0.02	0.00
s s w	0.35	0.31	0.27	0.23	0.19	0.15	0.11	0.07	0.04	0.01
sw by s	0.55	0.49	0.43	0.37	0.30	0.24	0.18	0.11	0.06	0.01
s w	1.20	1.12	1.03	0.53	0.44	0.35	0.25	0.17	0.09	0.02
sw by w	1.54	1.42	1.30	1.18	1.05	0.52	0.39	0.21	0.13	0.03
w s w	2.42	2.26	2.10	1.53	1.36	1.18	0.59	0.38	0.20	0.05
w by s	3.56	3.35	3.14	2.52	2.29	2.05	1.34	1.07	0.33	0.10
West.	5.37	5.15	4.51	4.27	4.01	3.32	3.00	2.21	1.39	0.49
w by n				6.21	5.58	5.33	5.06	4.35	4.06	3.39
w n w									6.24	6.09
☉ set	6.04	6.09	6.13	6.18	6.23	6.27	6.32	6.37	6.41	6.45
Sun's d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.
Amp.	2.44	5.28	8.13	10.57	13.42	16.27	19.13	21.59	24.12	25.54

## South Declination.

Deg.	0 d	2 d	5 d	7 d	10 d	12 d	15 d	17 d	20 d	22 d	23 d
Min.		30m		30m		30m		30m			30m
Point	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South	12	12	12	12	12	12	12	12	12	12	12
s by w	0.18	0.20	0.22	0.24	0.26	0.28	0.29	0.31	0.33	0.35	0.37
s s w	0.38	0.42	0.46	0.50	0.53	0.57	1.01	1.05	1.10	1.13	1.16
sw by s	1.01	1.07	1.13	1.19	1.25	1.31	1.37	1.44	1.50	1.56	2.00
s w	1.29	1.37	1.46	1.54	2.04	2.13	2.23	2.32	2.40	2.49	2.55
sw by w	2.05	2.17	2.29	2.41	2.53	3.05	3.18	3.32	3.46	3.58	4.08
w s w	2.58	3.14	3.30	3.46	4.02	4.20	4.38	4.57	5.18		
w by s	4.16	4.36	4.56	5.17	5.39						
West.	6.00										
☉ set	6.00	5.56	5.51	5.47	5.42	5.37	5.33	5.28	5.23	5.19	5.15

A Sun Dial for the Latitude of 25 Degrees.

North Declination.

Deg.	0	d 2	d 5	d 7	d 10	d 12	d 15	d 17	d 20	d 22	d 23
Min.		30m		30m		30m		30m			30m
Point.	h	h	h	h	h	h	h	h	h	h	h
South	12	12	12	12	12	12	12	12	12	12	12
s by w	0.19	0.17	0.16	0.14	0.12	0.10	0.08	0.06	0.04	0.02	0.01
s s w	0.40	0.36	0.32	0.29	0.25	0.21	0.17	0.13	0.09	0.05	0.03
sw by s	1.03	0.57	0.51	0.45	0.39	0.33	0.27	0.21	0.14	0.09	0.04
s w	1.32	1.23	1.15	1.06	0.57	0.49	0.40	0.31	0.21	0.13	0.06
sw by w	2.09	1.58	1.46	1.35	1.22	1.10	0.58	0.44	0.31	0.19	0.10
w s w	3.02	2.47	2.32	2.16	2.00	1.43	1.25	1.07	0.47	0.29	0.15
w by s	4.19	3.00	3.40	3.20	2.59	2.37	2.14	1.48	1.19	0.53	0.29
West	5.00	5.38	5.17	4.54	4.31	4.06	3.40	3.10	2.35	2.00	1.24
w by n					6.21	5.59	5.36	5.10	4.41	4.14	3.50
w n w										6.25	6.10
☉ set	6.00	6.05	6.09	6.14	6.19	6.24	6.29	6.34	6.39	6.43	6.47
Sun's	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.
Amp	0.00	2.45	5.31	8.16	11.3	13.49	16.35	19.22	22.10	24.25	26.7

South Declination.

Deg.	0	d 2	d 5	d 7	d 10	d 12	d 15	d 17	d 20	d 22	d 23
Min.		30m		30m		30m		30m			30m
Point.	h	h	h	h	h	h	h	h	h	h	h
South	12	12	12	12	12	12	12	12	12	12	12
s by w	0.19	0.21	0.23	0.25	0.27	0.28	0.30	0.32	0.34	0.36	0.38
s s w	0.40	0.43	0.47	0.51	0.55	0.59	1.02	1.06	1.11	1.14	1.17
sw by s	1.03	1.09	1.15	1.21	1.27	1.33	1.39	1.46	1.52	1.58	2.02
s w	1.32	1.40	1.48	1.57	2.06	2.14	2.23	2.33	2.42	2.50	2.57
sw by w	2.09	2.21	2.32	2.44	2.56	3.08	3.21	3.34	3.48	4.00	4.09
w s w	3.02	3.18	3.33	3.49	4.05	4.22	4.39	4.58	5.19		
w by s	4.19	4.39	4.58	5.18	5.39						
West	6.00										
☉ set	6.00	5.55	5.51	5.45	5.41	5.36	5.31	5.26	5.21	5.17	5.13



*A Sun-Dial for the Latitude of 26 Degrees.*

## North Declination.

Deg.	0	d 2	d 5	d 7	d 10	d 12	d 15	d 17	d 20	d 22	d 23
Min.		30m		30m		30m		30m			30m
Point	h	m	h	m	h	m	h	m	h	m	h
South	12	12	12	12	12	12	12	12	12	12	12
s by w	0.20	0.18	0.16	0.14	0.13	0.11	0.09	0.07	0.05	0.03	0.02
s s w	0.41	0.38	0.34	0.30	0.26	0.23	0.19	0.15	0.11	0.07	0.04
sw by s	1.05	0.59	0.54	0.48	0.42	0.36	0.30	0.24	0.17	0.11	0.07
s w	1.35	1.26	1.18	1.10	1.01	0.52	0.43	0.34	0.25	0.17	0.11
sw by w	2.13	2.02	1.50	1.39	1.27	1.15	1.03	0.50	0.36	0.25	0.16
w s w	3.07	2.52	2.37	2.21	2.06	1.49	1.32	1.14	0.55	0.38	0.25
w by s	4.22	4.04	3.45	3.25	3.06	2.45	2.18	1.58	1.31	1.07	0.45
West.	6.00	5.39	5.19	4.57	4.35	4.12	3.47	3.19	2.47	2.16	1.47
w by n					6.21	6.00	5.38	5.13	4.46	4.22	4.00
w n w									6.42	6.25	6.12
☉ set.	6.00	6.05	6.10	6.15	6.20	6.25	6.30	6.35	6.41	6.45	6.45
Sun's	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.
Amp.	0.00	2.46	5.34	8.20	11.8	13.56	16.44	19.33	22.22	24.38	26.22

## South Declination.

Deg.	0	d 2	d 5	d 7	d 10	d 12	d 15	d 17	d 20	d 22	d 23
Min.		30m		30m		30m		30m			30m
Point	h	m	h	m	h	m	h	m	h	m	h
South	12	12	12	12	12	12	12	12	12	12	12
s by w	0.20	0.22	0.24	0.25	0.27	0.29	0.31	0.33	0.35	0.36	0.38
s s w	0.41	0.45	0.49	0.52	0.56	1.00	1.04	1.08	1.12	1.15	1.18
sw by s	1.05	1.11	1.17	1.23	1.29	1.35	1.41	1.47	1.54	1.59	2.03
s w	1.35	1.43	1.51	2.00	2.08	2.17	2.26	2.35	2.44	2.52	2.59
sw by w	2.13	2.24	2.36	2.47	2.59	3.11	3.23	3.36	3.50	4.01	4.10
w s w	3.07	3.21	3.37	3.52	4.07	4.24	4.41	4.59	5.18		
w by s	4.22	4.41	5.00	5.19							
West.	6.00										
☉ set.	6.00	5.55	5.50	5.45	5.40	5.35	5.30	5.25	5.15	5.15	5.11



*A Sun Dial for the Latitude of 27 Degrees.*

North Declination.

Deg.	0	d	2	d	5	d	7	d	10	d	12	d	15	d	17	d	20	d	22	d	23	d
Min.			30m			30m			30m		30m		30m		30m						30m	
Point.	h	m	h	m	h	m	h	m	h	m	h	m	h	m	h	m	h	m	h	m	h	m
South	12		12		12		12		12		12		12		12		12		12		12	
s by w	0.21		0.19		0.17		0.15		0.13		0.12		0.10		0.08		0.06		0.04		0.03	
s s w	0.43		0.39		0.35		0.32		0.28		0.24		0.20		0.17		0.12		0.09		0.06	
sw by s	1.07		1.02		0.56		0.50		0.45		0.39		0.33		0.27		0.20		0.13		0.10	
s w	1.38		1.30		1.21		1.13		1.05		0.56		0.47		0.38		0.29		0.21		0.15	
swbw	2.17		2.06		1.55		1.43		1.32		1.20		1.08		0.55		0.42		0.32		0.23	
w s w	3.10		2.56		2.41		2.26		2.11		1.55		1.39		1.22		1.03		0.47		0.34	
w by s	4.25		4.07		3.49		3.31		3.11		2.51		2.30		2.07		1.42		1.19		0.59	
West.	6.00		5.40		5.21		5.00		4.39		4.17		3.53		3.27		2.58		2.30		2.05	
w by n								6.21		6.01		5.39		5.17		4.51		4.28		4.09		
w n w									6.21		6.26		6.31		6.37		6.43		6.48		6.51	
☉ fet	5.00		5.05		5.10		6.15		6.21		6.26		6.31		6.37		6.43		6.48		6.51	
Sun's	l.m.		d.m.		d.m.		d.m.		d.m.		d.m.		d.m.		d.m.		d.m.		d.m.		d.m.	
Amp	0.00		2.48		5.36		8.25		11.14		14.3		16.53		19.43		22.34		24.52		26.37	

South Declination.

Deg.	0	d	2	d	5	d	7	d	10	d	12	d	15	d	17	d	20	d	22	d	23	d
Min.			30m			30m			30m		30m		30m		30m						30m	
Point.	h	m	h	m	h	m	h	m	h	m	h	m	h	m	h	m	h	m	h	m	h	m
South	12		12		12		12		12		12		12		12		12		12		12	
s by w	0.21		0.22		0.24		0.26		0.28		0.30		0.32		0.34		0.36		0.37		0.38	
s s w	0.43		0.46		0.50		0.53		0.57		1.01		0.05		1.09		1.13		1.16		1.19	
sw by s	1.07		1.13		1.19		1.25		1.30		1.36		1.42		1.48		1.55		2.02		2.05	
s w	1.38		1.46		1.54		2.02		2.11		2.19		2.28		2.37		2.46		2.54		3.00	
swbw	2.17		2.28		2.39		2.50		3.02		3.13		3.26		3.38		3.52		4.01		4.10	
w s w	3.10		3.25		3.40		3.54		4.10		4.25		4.42		4.59		5.18					
w by s	4.25		4.43		5.02		5.20		5.39													
West	6.00																					
☉ fet	6.00		5.55		5.50		5.45		5.39		5.34		5.29		5.23		5.17		5.12		5.00	

*A Sun-Dial for the Latitude of 28 Degrees.*

## North Declination.

Deg.	0	d 2	d 5	d 7	d 10	d 12	d 15	d 17	d 20	d 22	d 23
Min.		30m		30m		30m		30m			30m
Point.	h	m	h	m	h	m	h	m	h	m	h
South	12	12	12	12	12	12	12	12	12	12	12
s by w	0.21	0.20	0.18	0.16	0.14	0.13	0.11	0.09	0.07	0.05	0.04
s s w	0.44	0.40	0.37	0.33	0.30	0.26	0.22	0.18	0.14	0.11	0.08
sw by s	1.10	1.04	0.58	0.53	0.47	0.41	0.35	0.29	0.22	0.16	0.13
s w	1.41	1.33	1.25	1.17	1.08	1.00	0.51	0.42	0.35	0.25	0.19
sw by w	2.20	2.10	1.59	1.48	1.36	1.25	1.13	1.05	0.48	0.37	0.28
w s w	3.14	3.00	2.46	2.31	2.17	2.01	1.45	1.29	1.11	0.55	0.43
w by s	4.28	4.11	3.53	3.39	3.17	3.00	2.38	2.16	1.52	1.31	1.13
West.	6.00	5.41	5.22	5.04	4.43	4.21	3.59	3.35	3.07	2.42	2.20
w by n					6.21	6.04	5.41	5.21	4.56	4.34	4.16
w n w									6.42	6.27	6.14
☉ set.	6.00	6.05	6.11	6.16	6.22	6.27	6.33	6.39	6.45	6.50	6.53
Sun's	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.
Amp.	0.00	2.50	5.40	8.30	11.21	14.11	17.3	19.56	22.48	25.6	26.52

## South Declination.

Deg.	0	d 2	d 5	d 7	d 10	d 12	d 15	d 17	d 20	d 22	d 23
Min.		30m		30m		30m		30m			30m
Point.	h	m	h	m	h	m	h	m	h	m	h
South	12	12	12	12	12	12	12	12	12	12	12
s by w	0.21	0.23	0.25	0.27	0.28	0.30	0.32	0.34	0.36	0.38	0.39
s s w	0.44	0.45	0.51	0.55	0.58	1.02	1.06	1.10	1.14	1.17	1.20
sw by s	1.10	1.15	1.21	1.27	1.32	1.38	1.44	1.51	1.57	2.03	2.06
s w	1.41	1.49	1.57	2.05	2.13	2.21	2.30	2.39	2.47	2.56	3.02
sw by w	2.20	2.31	2.42	2.53	3.04	3.16	3.28	3.40	3.53	4.04	4.13
w s w	3.14	3.28	3.43	3.57	4.12	4.27	4.43	5.00	5.18		
w by s	4.28	4.45	5.03	5.21	5.39						
West.	6.00										
☉ set.	6.00	5.55	5.49	5.44	5.38	5.33	5.27	5.21	5.15	5.10	5.07

A Sun-Dial for the Latitude of 29 Degrees.

North Declination.

Deg.	0	d	2	d	5	d	7	d	10	d	12	d	15	d	17	d	20	d	22	d	23	d
Min.			30m				30m				30m				30m						30m	
Point.	h	m	h	m	h	m	h	m	h	m	h	m	h	m	h	m	h	m	h	m	h	m
South	12		12		12		12		12		12		12		12		12		12		12	
s by w	0.22		0.20		0.19		0.17		0.15		0.13		0.11		0.10		0.08		0.06		0.05	
s s w	0.45		0.42		0.38		0.35		0.31		0.27		0.23		0.19		0.16		0.12		0.10	
sw by s	1.12		1.06		1.01		0.55		0.49		0.43		0.37		0.31		0.25		0.20		0.16	
s w	1.43		1.36		1.28		1.20		1.12		1.03		0.55		0.46		0.37		0.29		0.25	
sw by w	2.24		2.13		2.03		1.52		1.41		1.30		1.18		1.06		0.53		0.42		0.34	
w s w	3.18		3.04		2.50		2.36		2.22		2.07		1.52		1.35		1.18		1.03		0.51	
w by s	4.31		4.14		3.57		3.40		3.22		3.04		2.45		2.24		2.01		1.41		1.24	
West	6.00		5.42		5.24		5.05		4.46		4.26		4.04		3.41		3.16		2.53		2.33	
w by n								6.21		6.02		5.43		5.22		5.00		4.40		4.23		
w n w															6.42		6.27		6.15			
☉ set	6.00		6.06		6.11		6.17		6.23		6.28		6.34		6.40		6.47		6.52		6.56	
Sun's	d.m.		d.m.		d.m.		d.m.		d.m.		d.m.		d.m.		d.m.		d.m.		d.m.		d.m.	
Amp.	0.00		2.51		5.43		8.34		11.27		14.19		17.12		20.08		22.52		25.23		27.8	

South Declination.

Deg.	0	d	2	d	5	d	7	d	10	d	12	d	15	d	17	d	20	d	22	d	23	d
Min.			30m				30m				30m				30m						30m	
Point.	h	m	h	m	h	m	h	m	h	m	h	m	h	m	h	m	h	m	h	m	h	m
South	12		12		12		12		12		12		12		12		12		12		12	
s by w	0.22		0.24		0.26		0.27		0.29		0.31		0.33		0.35		0.37		0.38		0.39	
s s w	0.45		0.49		0.53		0.56		1.00		1.04		1.08		1.11		1.15		1.18		1.21	
sw by s	1.12		1.17		1.23		1.29		1.34		1.40		1.46		1.52		1.59		2.04		2.08	
s w	1.43		1.51		1.59		2.07		2.15		2.24		2.32		2.41		2.50		2.58		3.04	
sw by w	2.24		2.34		2.45		2.56		3.07		3.18		3.30		3.42		3.55		4.05		4.14	
w s w	3.18		3.32		3.46		4.00		4.14		4.29		4.44		5.00							
w by s	4.31		4.48		5.04		5.22		5.39													
West	6.00																					
☉ set	6.00		5.54		5.49		5.43		5.37		5.32		5.26		5.20		5.13		5.07		5.00	

*A Sun Dial for the Latitude of 30 Degrees.*

## North Declination.

Deg.	0 d	2 d	5 d	7 d	10 d	12 d	15 d	17 d	20 d	22 d	23 d
Min.		30m		30m		30m		30m			30m
Point.	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South	12	12	12	12	12	12	12	12	12	12	12
s by w	0.23	0.21	0.19	0.18	0.16	0.14	0.12	0.10	0.08	0.07	0.06
s s w	0.47	0.43	0.40	0.36	0.33	0.29	0.25	0.21	0.17	0.14	0.12
s w by s	1.14	1.08	1.03	0.58	0.52	0.46	0.40	0.34	0.28	0.23	0.19
s w	1.46	1.38	1.31	1.23	1.15	1.07	0.58	0.50	0.41	0.33	0.27
s w by w	2.27	2.17	2.06	1.56	1.45	1.34	1.23	1.11	0.58	0.48	0.40
w s w	3.21	3.08	2.55	2.41	2.27	2.13	1.58	1.42	1.25	1.11	0.59
w by s	4.33	4.17	4.01	3.44	3.27	3.10	2.51	2.31	2.10	1.51	1.35
West	6.00	5.43	5.25	5.07	4.49	4.30	4.09	3.48	3.24	3.02	2.44
w by n					6.21	6.03	5.45	5.25	5.03	4.45	4.29
w n w									6.42	6.28	6.17
☉ fet	6.00	6.06	6.12	6.18	6.23	6.29	6.36	6.42	6.48	6.54	6.59
Sun's	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.
Amp.	0.00	2.53	5.46	8.40	11.34	14.28	17.22	20.18	23.16	25.38	27.25

## South Declination.

Deg.	0 d	2 d	5 d	7 d	10 d	12 d	15 d	17 d	20 d	22 d	23 d
Min.		30m		30m		30m		30m			30m
Point.	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South	12	12	12	12	12	12	12	12	12	12	12
s by w	0.23	0.24	0.26	0.28	0.30	0.31	0.33	0.35	0.37	0.39	0.40
s s w	0.47	0.50	0.54	0.57	1.01	1.05	1.08	1.12	1.16	1.19	1.22
s w by s	1.14	1.19	1.25	1.30	1.36	1.42	1.48	1.54	2.00	2.05	2.09
s w	1.46	1.54	2.02	2.10	2.18	2.26	2.34	2.43	2.52	2.59	3.05
s w by w	2.27	2.38	2.48	2.58	3.09	3.20	3.32	3.43	3.56	4.06	4.14
w s w	3.21	3.35	3.48	4.01	4.16	4.30	4.45	5.01			
w by s	3.33	4.49	5.05	5.22	5.39						
West	5.00										
☉ fet	5.00	5.54	5.48	5.42	5.37	5.31	5.24	5.18	5.12	5.06	5.01



A Sun-Dial for the Latitude of 31 Degrees.

North Declination.

Deg.	0	d 2	d 5	d 7	d 10	d 12	d 15	d 17	d 20	d 22	d 23	d
Min.		30m		30m		30m		30m			30m	
Point.	h	m	h	m	h	m	h	m	h	m	h	m
South	12	12	12	12	12	12	12	12	12	12	12	12
s by w	0.23	0.22	0.20	0.18	0.17	0.15	0.13	0.11	0.09	0.08	0.07	
s s w	0.48	0.45	0.41	0.38	0.34	0.31	0.27	0.23	0.19	0.16	0.13	
sw by s	1.16	1.11	1.05	1.00	0.54	0.48	0.43	0.37	0.31	0.25	0.21	
s w	1.49	1.41	1.34	1.26	1.18	1.10	1.02	0.53	0.45	0.37	0.32	
sw by w	2.30	2.20	2.10	2.00	1.49	1.38	1.27	1.16	1.04	0.54	0.46	
w s w	3.25	3.12	2.59	2.45	2.32	2.18	2.03	1.48	1.32	1.18	1.07	
w by s	4.36	4.20	4.04	3.48	3.32	3.15	2.57	2.38	2.18	2.00	1.46	
West	6.00	5.43	5.26	5.09	4.52	4.33	4.14	3.53	3.31	3.11	2.55	
w by n					6.21	6.04	5.46	5.27	5.07	4.49	4.35	
w n w									6.43	6.29	6.18	
☉ fet	6.00	6.06	6.12	6.18	6.24	6.31	6.37	6.44	6.51	6.56	7.01	
Sun's	d.m.	d.m.	d.m.	d.m.	1.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	
Amp.	0.00	2.55	5.50	8.45	11.41	14.37	17.24	20.21	22.31	25.55	27.43	

South Declination.

Deg.	0	d 2	d 5	d 7	d 10	d 12	d 15	d 17	d 20	d 22	d 23	d
Min.		30m		30m		30m		30m			30m	
Point.	h	m	h	m	h	m	h	m	h	m	h	m
South	12	12	12	12	12	12	12	12	12	12	12	12
s by w	0.23	0.25	0.27	0.28	0.30	0.32	0.34	0.36	0.38	0.39	0.40	
s s w	0.48	0.52	0.55	0.59	1.02	1.06	1.10	1.13	1.17	1.20	1.23	
sw by s	1.16	1.21	1.27	1.32	1.38	1.44	1.49	1.55	2.01	2.07	2.11	
s w	1.49	1.57	2.04	2.12	2.20	2.28	2.36	2.45	2.53	3.01	3.08	
sw by w	2.30	2.41	2.51	3.01	3.12	3.23	3.34	3.45	3.57	4.07	4.15	
w s w	3.25	3.38	3.51	4.04	4.18	4.32	4.46	5.01	5.17			
w by s	4.36	4.50	5.07	5.23								
West	6.00											
☉ let	6.00	5.54	5.48	5.42	5.30	5.29	5.23	5.16	5.09	5.04	4.59	

*A Sun Dial for the Latitude of 32 Degrees.*

## North Declination.

Deg.	0 d	2 d	5 d	7 d	10 d	12 d	15 d	17 d	20 d	22 d	23 d
Min.		30m		30m		30m		30m			30m
Point	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South	12	12	12	12	12	12	12	12	12	12	12
s by w	0.24	0.22	0.21	0.19	0.17	0.16	0.14	0.12	0.10	0.09	0.07
s s w	0.50	0.46	0.43	0.39	0.36	0.32	0.29	0.25	0.21	0.18	0.15
s whys	1.18	1.13	1.07	1.02	0.96	0.91	0.85	0.79	0.73	0.68	0.64
s w	1.52	1.44	1.37	1.29	1.22	1.14	1.05	0.96	0.88	0.81	0.76
s w w	2.34	2.24	2.14	2.04	1.94	1.83	1.72	1.61	1.50	1.39	1.29
w s w	3.28	3.15	3.03	2.57	2.37	2.23	2.09	1.54	1.39	1.25	1.15
w by s	4.38	4.23	4.08	3.52	3.37	3.20	3.03	2.45	2.26	2.09	1.55
West	6.00	5.44	5.28	5.11	4.55	4.37	4.21	3.59	3.38	3.19	3.04
w by n					6.22	6.05	5.48	5.30	5.10	4.53	4.39
w n w									6.43	6.30	6.19
☉ fet	6.00	6.06	6.13	6.19	6.25	6.32	6.39	6.46	6.53	6.58	7.03
Sun's	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.
Amp.	0.00	2.57	5.54	8.51	11.48	14.47	17.46	19.47	22.47	26.43	28.3

## South Declination.

Deg.	0 d	2 d	5 d	7 d	10 d	12 d	15 d	17 d	20 d	22 d	23 d
Min.		30m		30m		30m		30m			30m
Point	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South	12	12	12	12	12	12	12	12	12	12	12
s by w	0.34	0.26	0.27	0.29	0.31	0.33	0.34	0.36	0.38	0.40	0.41
s s w	0.50	0.53	0.56	1.00	1.03	1.07	1.10	1.14	1.18	1.21	1.24
s whys	1.18	1.23	1.29	1.34	1.40	1.45	1.51	1.57	2.03	2.08	2.12
s w	1.52	1.59	2.07	2.14	2.22	2.30	2.38	2.45	2.51	3.02	3.08
swb w	2.24	2.44	2.54	3.04	3.14	3.25	3.35	3.47	3.59	4.08	4.16
w s w	3.28	3.41	3.53	4.06	4.19	4.33	4.47	5.02			
w by s	4.38	4.53	5.08	5.53							
West	6.00										
☉ fet	5.00	5.54	5.47	5.41	5.35	5.28	5.21	5.14	5.07	5.02	4.57

*A Sun-Dial for the Latitude of 33 Degrees.*

North Declination.

Deg.	0	d 2	d 5	d 7	d 10	d 12	d 15	d 17	d 20	d 22	d 23	d
Min.		30m		30m		30m		30m			30m	
Point.	h	m	h	m	h	m	h	m	h	m	h	m
South	12	12	12	12	12	12	12	12	12	12	12	
s by w	0.25	0.23	0.21	0.20	0.18	0.16	0.15	0.13	0.11	0.09	0.08	
s s w	0.51	0.47	0.44	0.41	0.37	0.34	0.30	0.27	0.23	0.19	0.17	
s w by s	1.20	1.15	1.09	1.04	0.99	0.93	0.88	0.82	0.76	0.71	0.67	
s w	1.54	1.47	1.40	1.32	1.24	1.17	1.09	1.01	0.93	0.86	0.81	
sw by w	2.37	2.27	2.17	2.07	1.97	1.87	1.76	1.65	1.54	1.44	1.37	
w s w	3.31	3.19	3.06	2.54	2.41	2.28	2.14	2.00	1.85	1.72	1.62	
w by s	4.40	4.25	4.11	3.56	3.41	3.25	3.09	2.91	2.73	2.57	2.44	
West.	5.00	5.45	5.29	5.13	4.57	4.40	4.23	4.04	3.44	3.26	3.12	
w by n					6.21	6.05	5.49	5.32	5.15	4.57	4.44	
w n w									6.43	6.30	6.20	
☉ set.	6.00	6.07	6.13	6.20	6.26	6.33	6.40	6.47	6.55	7.01	7.06	
Sun's	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	
Amp.	0.00	2.59	5.58	8.57	11.57	14.57	17.58	21.1	24.24	26.31	28.24	

South Declination.

Deg.	0	d 2	d 5	d 7	d 10	d 12	d 15	d 17	d 20	d 22	d 23	d
Min.		30m		30m		30m		30m			30m	
Point	h	m	h	m	h	m	h	m	h	m	h	m
South	12	12	12	12	12	12	12	12	12	12	12	
s by w	0.25	0.26	0.28	0.30	0.31	0.33	0.35	0.37	0.39	0.40	0.41	
s s w	0.51	0.54	0.56	1.01	1.05	1.08	1.12	1.15	1.19	1.22	1.25	
s w by s	1.20	1.25	1.30	1.35	1.41	1.47	1.52	1.58	2.04	2.09	2.13	
s w	1.54	2.02	2.09	2.17	2.24	2.32	2.40	2.48	2.58	3.05	3.10	
sw by w	2.37	2.46	2.56	3.06	3.16	3.27	3.37	3.48	4.00	4.09	4.17	
w s w	3.31	3.43	3.56	4.08	4.21	4.34	4.48	5.02				
w by s	4.40	4.54	5.09	5.24								
West.	6.00											
☉ set.	6.00	5.53	5.47	5.40	5.34	5.27	5.20	5.13	5.05	4.59	4.54	



*A Sun-Dial for the Latitude of 34 Degrees.*

## North Declination

Deg.	0	d 2	d 5	d 7	d 10	d 12	d 15	d 17	d 20	d 22	d 23
Min.		30m		30m		30m		30m			30m
Point.	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South	12	12	12	12	12	12	12	12	12	12	12
s by w	0.25	0.24	0.22	0.20	0.19	0.17	0.15	0.14	0.12	0.10	0.09
s s w	0.52	0.49	0.45	0.42	0.39	0.35	0.32	0.28	0.24	0.21	0.19
sw by s	1.22	1.17	1.12	1.07	1.01	0.56	0.50	0.44	0.38	0.34	0.30
s w	1.57	1.50	1.42	1.35	1.28	1.20	1.12	1.04	0.56	0.40	0.43
s w by w	2.40	2.30	2.21	2.11	2.01	1.51	1.41	1.30	1.19	1.09	1.02
w s w	3.34	3.22	3.10	2.58	2.45	2.33	2.19	2.06	1.51	1.39	1.29
w by s	4.42	4.28	4.14	3.59	3.45	3.30	3.14	2.57	2.40	2.24	2.12
West.	6.00	5.45	5.30	5.15	5.00	4.43	4.26	4.09	3.49	3.33	3.19
w by n					6.21	6.06	5.50	5.32	5.16	5.01	4.49
w n w									6.43	6.31	6.21
☉ fet.	6.00	6.07	6.14	6.20	6.27	6.34	6.42	6.49	6.57	7.03	7.08
Sun's	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.
Amp.	0.00	3.01	6.01	9.03	12.5	15.8	18.12	21.16	24.22	26.5	28.45

## South Declination.

Deg.	0	d 2	d 5	d 7	d 10	d 12	d 15	d 17	d 20	d 22	d 23
Min.		30m		30m		30m		30m			30m
Point.	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South	12	12	12	12	12	12	12	12	12	12	12
s by w	0.25	0.27	0.29	0.30	0.32	0.34	0.35	0.37	0.39	0.41	0.42
s s w	0.52	0.55	0.59	1.02	1.06	1.09	1.13	1.16	1.22	1.23	1.26
sw by s	1.22	1.27	1.32	1.38	1.43	1.48	1.54	2.00	2.05	2.10	2.14
s w	1.57	2.04	2.11	2.19	2.26	2.34	2.42	2.50	2.58	3.05	3.10
s w by w	2.40	2.49	2.59	3.09	3.18	3.28	3.39	3.50	4.01	4.10	4.18
w s w	3.34	3.46	3.58	4.10	4.22	4.35	4.48	5.02			
w by s	4.42	4.56	5.10	5.24							
West.	6.00										
☉ fet.	6.00	5.53	5.46	5.40	5.33	5.26	5.18	5.11	5.03	4.57	4.52



A Sun-Dial for the Latitude of 35 Degrees.

Noth Declination.

Deg.	0	d 2	d 5	d 7	d 10	d 12	d 15	d 17	d 20	d 22	d 23	d
Min.		30m		30m		30m		30m			30m	
Point.	h	mh	mh	mh	mh	mh	mh	mh	mh	mh	mh	m
South	12	12	12	12	12	12	12	12	12	12	12	
s by w	0.26	0.24	0.21	0.23	0.19	0.18	0.16	0.14	0.13	0.11	0.10	
ss w	0.53	0.50	0.47	0.44	0.40	0.37	0.33	0.30	0.26	0.23	0.20	
s w by s	1.24	1.19	1.14	1.08	1.03	0.58	0.52	0.47	0.41	0.36	0.32	
s w	1.59	1.52	1.45	1.38	1.31	1.23	1.15	1.08	0.99	0.53	0.47	
sw by w	2.43	2.33	2.24	2.14	2.05	1.55	1.45	1.34	1.23	1.14	1.07	
ws w	3.37	3.25	3.13	3.02	2.50	2.37	2.24	2.11	1.57	1.45	1.36	
w by s	3.43	4.29	4.16	4.03	3.48	3.34	3.19	3.01	2.46	2.31	2.20	
West.	6.00	5.46	5.31	5.17	5.02	4.46	4.30	4.13	3.55	3.39	3.26	
w by n					6.21	6.07	5.52	5.38	5.19	5.04	4.53	
w n w									6.44	6.32	6.22	
☉ fet.	6.00	6.07	6.14	6.21	6.28	6.35	6.43	6.51	6.59	7.06	7.11	
Sun's	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	
Amp.	0.00	3.03	6.06	9.10	12.14	15.18	18.25	21.32	24.40	27.42	29.8	

South Declination.

Deg.	0	d 2	d 5	d 7	d 10	d 12	d 15	d 17	d 20	d 22	d 23	d
Min.		30m		30m		30m		30m			30m	
Point.	h	mh	mh	mh	mh	mh	mh	mh	mh	mh	mh	m
South	12	12	12	12	12	12	12	12	12	12	12	
s by w	0.26	0.28	0.29	0.31	0.33	0.34	0.36	0.38	0.40	0.41	0.42	
ss w	0.53	0.57	1.00	1.04	1.07	1.10	1.14	1.17	1.21	1.24	1.27	
sw by s	1.24	1.29	1.34	1.39	1.45	1.50	1.55	2.01	2.07	2.12	2.15	
s w	1.59	2.06	2.14	2.21	2.28	2.36	2.43	2.51	2.59	3.06	3.11	
sw by w	2.43	2.52	3.01	3.11	3.20	3.30	3.40	3.51	4.02	4.11	4.18	
ws w	3.37	3.48	4.00	4.12	4.24	4.36	4.49	5.02				
w by s	4.43	4.57	5.11	5.24								
West.	6.00											
☉ fet.	6.00	5.53	5.46	5.39	5.32	5.25	5.17	5.09	5.01	4.54	4.49	

*A Sun-Dial for the Latitude of 36 Degrees.*

## North Declination

Deg.	0	d 2	d 5	d 7	d 10	d 12	d 15	d 17	d 20	d 22	d 23
Min.		30m		30m		30m		30m			30m
Point.	h	m	h	m	h	m	h	m	h	m	h
South	12	12	12	12	12	12	12	12	12	12	12
s by w	0.27	0.25	0.23	0.22	0.20	0.19	0.17	0.15	0.13	0.12	0.11
s s w	0.55	0.51	0.48	0.45	0.42	0.38	0.35	0.31	0.28	0.24	0.22
sw by s	1.26	1.21	1.16	1.11	1.05	1.00	0.55	0.49	0.44	0.39	0.35
s w	2.02	1.55	1.48	1.41	1.34	1.26	1.19	1.11	1.04	0.56	0.51
s w by w	2.45	2.36	2.27	2.18	2.08	1.59	1.49	1.39	1.28	1.19	1.12
w s w	3.39	3.28	3.17	3.05	2.53	2.41	2.29	2.16	2.03	1.51	1.42
w by s	4.45	4.32	4.19	4.06	3.52	3.38	3.23	3.08	2.52	2.38	2.27
West.	6.00	5.46	5.32	5.18	5.04	4.49	4.33	4.17	4.00	3.45	3.33
w by n					6.22	6.08	5.53	5.38	5.22	5.08	4.57
w n w									6.44	5.33	6.24
☉ set.	6.00	6.07	6.15	6.22	6.29	6.37	6.45	6.53	7.08	7.03	7.14
Sun's	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.
Amp.	0.00	3.06	6.11	9.17	12.24	15.31	18.40	21.49	25.0	27.35	29.32

## South Declination.

Deg.	0	d 2	d 5	d 7	d 10	d 12	d 15	d 17	d 20	d 22	d 23
Min.		30m		30m		30m		30m			30m
Point.	h	m	h	m	h	m	h	m	h	m	h
South	12	12	12	12	12	12	12	12	12	12	12
s by w	0.27	0.28	0.30	0.31	0.33	0.35	0.36	0.38	0.40	0.41	0.43
s s w	0.55	0.58	1.01	1.05	1.08	1.11	1.15	1.18	1.22	1.25	1.27
sw by s	1.26	1.31	1.36	1.41	1.46	1.51	1.57	2.02	2.08	2.13	2.16
s w	2.02	2.09	2.16	2.23	2.30	2.37	2.45	2.53	3.01	3.07	3.12
s w by w	2.45	2.54	3.04	3.13	3.22	3.32	3.42	3.52	4.03	4.12	4.18
w s w	3.39	3.51	4.02	4.13	4.25	4.37	4.49	5.02			
w by s	4.45	4.58	5.11	5.25							
West.	6.00										
☉ set	6.00	5.31	5.45	5.38	5.31	5.23	5.15	5.07	4.59	4.52	4.46

A Sun-Dial for the Latitude of 37 Degrees.

North Declination.

Deg.	0	d 2	d 5	d 7	d 10	d 12	d 15	d 17	d 20	d 22	d 23
Min.		30m		30m		30m		30m			30m
Point.	h	h	m	m	h	h	m	m	h	h	m
South	12	12	12	12	12	12	12	12	12	12	12
s by w	0.27	0.26	0.24	0.23	0.21	0.19	0.18	0.16	0.14	0.13	0.12
ss w	0.56	0.53	0.50	0.46	0.43	0.40	0.36	0.33	0.29	0.26	0.24
sw by s	1.28	1.23	1.18	1.13	1.08	1.02	0.57	0.52	0.47	0.41	0.38
s w	2.04	1.57	1.50	1.43	1.36	1.29	1.22	1.14	1.07	1.00	0.55
sw by w	2.48	2.39	2.30	2.21	2.12	2.03	1.53	1.43	1.33	1.24	1.17
w s w	3.42	3.31	3.20	3.09	2.57	2.46	2.34	2.21	2.08	1.57	1.48
w by s	4.47	4.34	4.21	4.09	3.56	3.42	3.28	3.13	2.58	2.45	2.34
West.	6.00	5.47	5.33	5.19	5.06	4.52	4.37	4.21	4.05	3.50	3.39
w by n					5.22	5.08	5.54	5.40	5.24	5.11	5.00
w n w									5.44	6.33	6.25
☉ set	6.00	6.08	6.15	6.23	6.31	6.39	6.47	6.55	7.04	7.11	7.17
Sun's d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.
Amp	0.00	3.08	6.16	9.25	12.33	16.42	18.55	22.7	25.22	27.58	29.58

South Declination.

Deg.	0	d 2	d 5	d 7	d 10	d 12	d 15	d 17	d 20	d 22	d 23
Min.		30m		30m		30m		30m			30m
Point.	h	h	m	m	h	h	m	m	h	h	m
South	12	12	12	12	12	12	12	12	12	12	12
s by w	0.27	0.29	0.31	0.32	0.34	0.35	0.37	0.39	0.41	0.42	0.43
ss w	0.56	0.59	1.02	1.06	1.09	1.12	1.16	1.19	1.23	1.26	1.22
sw by s	1.28	1.33	1.37	1.42	1.47	1.53	1.58	2.04	2.09	2.14	2.17
s w	2.04	2.11	2.18	2.25	2.32	2.39	2.46	2.54	3.01	3.08	3.13
sw by w	2.48	2.57	3.06	3.15	3.24	3.33	3.43	3.53	4.03	4.12	4.19
w s w	3.42	3.53	4.04	4.15	4.26	4.38	4.50	5.03			
w by s	4.47	5.00	5.12	5.25							
West	6.00										
☉ set	6.00	5.52	5.45	5.37	5.29	5.21	5.13	5.05	4.56	4.49	4.43

## A Sun-Dial for the Latitude of 38 Degrees.

## North Declination.

Deg.	0	d 2	d 5	d 7	d 10	d 12	d 15	d 17	d 20	d 22	d 23
Min.		30m		30m		30m		30m			30m
Point.	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South	12	12	12	12	12	12	12	12	12	12	12
s by w	0.28	0.26	0.25	0.23	0.21	0.20	0.18	0.17	0.15	0.13	0.12
s s w	0.57	0.54	0.51	0.48	0.45	0.41	0.38	0.34	0.31	0.28	0.26
sw by s	1.29	1.24	1.20	1.15	1.10	1.05	1.00	0.54	0.49	0.44	0.41
s w	2.06	2.00	1.53	1.46	1.39	1.32	1.25	1.18	1.10	1.04	0.59
sw by w	2.51	2.42	2.33	2.24	2.15	2.06	1.57	1.47	1.37	1.29	1.12
w s w	3.44	3.34	3.23	3.12	3.01	2.50	2.39	2.26	2.13	2.03	1.54
w by s	4.48	4.36	4.24	4.12	4.01	3.46	3.33	3.18	3.03	2.50	2.40
West.	5.00	5.47	5.34	5.21	5.08	4.54	4.41	4.25	4.09	3.55	3.45
w by n					6.22	6.09	5.56	5.41	5.26	5.14	5.04
w n w									6.45	6.34	6.26
☉ set	5.00	6.08	6.16	6.24	6.32	6.40	6.48	6.57	7.06	7.14	7.19
Sun's	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.
Amp.	0.00	3.10	5.21	9.32	12.43	15.58	19.10	22.26	25.43	28.23	30.25

## South Declination.

Deg.	0	d 2	d 5	d 7	d 10	d 12	d 15	d 17	d 20	d 22	d 23
Min		30m		30m		30m		30m			30m
Point.	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South	12	12	12	12	12	12	12	12	12	12	12
s by w	0.28	0.30	0.31	0.33	0.34	0.36	0.38	0.39	0.41	0.42	0.44
s s w	0.57	1.00	1.04	1.07	1.10	1.13	1.16	1.20	1.24	1.27	1.29
sw by s	1.29	1.34	1.39	1.44	1.49	1.54	1.59	2.05	2.10	2.15	2.18
s w	2.06	2.13	2.20	2.27	2.34	2.41	2.48	2.55	3.03	3.09	3.14
sw by w	2.51	2.59	3.08	3.17	3.26	3.35	3.44	3.54	4.04	4.13	4.19
w s w	3.44	3.55	4.06	4.17	4.28	4.39	4.50	5.02			
w by s	4.48	5.00	5.13	5.25							
West	6.00										
☉ set	6.00	5.52	5.44	5.36	5.28	5.20	5.12	5.03	4.54	4.46	4.41



A Sun-Dial for the Latitude of 39 Degrees.

North Declination.

Deg.	0	d 2	d 5	d 7	d 10	d 12	d 15	d 17	d 20	d 22	d 23	
Min.		30m		30m		30m		30m			30m	
Point.	h	m	h	m	h	m	h	m	h	m	h	r
South	12	12	12	12	12	12	12	12	12	12	12	
s by w	0.29	0.27	0.25	0.24	0.22	0.21	0.19	0.17	0.16	0.14	0.13	
ss w	0.58	0.55	0.52	0.49	0.46	0.43	0.39	0.36	0.32	0.30	0.27	
sw by s	1.31	1.26	1.22	1.17	1.12	1.07	1.02	0.57	0.51	0.47	0.43	
s w	2.09	2.02	1.55	1.49	1.42	1.35	1.28	1.21	1.13	1.07	1.02	
sw by w	2.53	2.45	2.36	2.27	2.19	2.10	2.01	1.51	1.41	1.33	1.27	
w s w	3.47	3.36	3.26	3.15	3.05	2.54	2.42	2.31	2.18	2.08	2.00	
w by s	4.50	4.38	4.26	4.14	4.02	3.49	3.36	3.23	3.08	2.56	2.47	
West.	6.00	5.48	5.35	5.22	5.10	4.56	4.43	4.28	4.13	4.00	3.50	
w by n					6.22	6.10	5.57	5.43	5.29	5.16	5.07	
w n w									6.45	6.35	6.27	
☉ fet.	6.00	6.08	6.16	6.24	6.33	6.41	6.50	6.59	7.09	7.16	7.22	
Sun's	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	
Amp.	0.00	3.13	6.26	9.40	12.55	16.10	19.27	22.45	26.7	28.49	30.53	

South Declination.

Deg.	0	d 2	d 5	d 7	d 10	d 12	d 15	d 17	d 20	d 22	d 23
Min.		30m		30m		30m		30m			30m
Point.	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South	12	12	12	12	12	12	12	12	12	12	12
s by w	0.29	0.30	0.32	0.33	0.35	0.36	0.38	0.40	0.41	0.43	0.44
ss w	0.58	1.02	1.05	1.08	1.11	1.14	1.18	1.21	1.25	1.27	1.30
sw by s	1.31	1.36	1.41	1.46	1.51	1.56	2.01	2.06	2.11	2.16	2.19
s w	2.09	2.15	2.22	2.27	2.35	2.42	2.49	2.57	3.04	3.10	3.15
sw by w	2.53	3.02	3.10	3.19	3.27	3.36	3.46	3.55	4.05	4.13	4.20
w s w	3.47	3.57	4.08	4.18	4.29	4.39	4.51	5.03			
w by s	4.50	5.02	5.14	5.26							
West	6.00										
☉ fet.	6.00	5.52	5.44	5.36	5.27	5.19	5.10	5.01	4.51	4.44	4.38

*A Sun-Dial for the Latitude of 40 Degrees.*

## North Declination.

Deg.	0	d 2	d 5	d 7	d 10	d 12	d 15	d 17	d 20	d 22	d 23
Min.		30m		30m		30m		30m			30m
Point.	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South	12	12	12	21	12	12	12	12	12	12	12
s by w	0.29	0.28	0.26	0.24	0.23	0.21	0.20	0.18	0.17	0.15	0.14
s s w	1.00	0.57	0.53	0.50	0.47	0.44	0.41	0.37	0.34	0.31	0.29
sw by s	1.33	1.28	1.26	1.19	1.14	1.09	1.04	0.59	0.54	0.49	0.46
s w	2.11	2.04	1.58	1.51	1.45	1.38	1.31	1.24	1.17	1.11	1.06
sw by w	2.56	2.47	2.39	2.30	2.22	2.14	2.04	1.55	1.46	1.38	1.31
w s w	3.49	3.39	3.29	3.18	3.08	2.58	2.47	2.35	2.23	2.13	2.05
w by s	4.51	4.40	4.28	4.17	4.05	3.53	3.40	3.27	3.13	3.02	2.52
West.	6.00	5.48	5.35	5.23	5.11	4.59	4.46	4.32	4.17	4.05	3.55
w by n					6.22	6.11	5.58	5.45	5.31	5.19	5.10
w n w							6.58	6.46	6.36	6.28	
☉ set	6.00	6.08	6.17	6.25	6.34	6.43	6.52	7.01	7.11	7.19	7.26
Sun's	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.
Amp.	0.00	3.14	5.32	9.48	13.6	16.24	19.45	23.6	26.31	29.26	31.22

## South Declination.

Deg.	0	d 2	d 5	d 7	d 10	d 12	d 15	d 17	d 20	d 22	d 23
Min		30m		30m		30m		30m			30m
Point.	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South	12	12	12	12	12	12	12	12	12	12	12
s by w	0.29	0.31	0.32	0.34	0.35	0.37	0.38	0.40	0.42	0.43	0.44
s s w	1.00	1.03	1.06	1.09	1.12	1.15	1.18	1.22	1.25	1.28	1.30
sw by s	1.33	1.38	1.43	1.47	1.52	1.57	2.02	2.07	2.12	2.17	2.20
s w	2.11	2.17	2.24	2.31	2.37	2.44	2.51	2.58	3.05	3.11	3.16
sw by w	2.56	3.04	3.12	3.21	3.29	3.38	3.47	3.56	4.06	4.14	4.20
w s w	3.49	3.59	4.09	4.19	4.30	4.40	4.51				
w by s	4.51	5.03	5.14	5.26							
West	6.00										
☉ set.	6.00	5.52	5.43	5.35	5.26	5.17	5.08	4.59	4.49	4.41	4.34

A Sun-Dial for the Latitude of 41 Degrees.

North Declination.

Deg.	0	d 2	d 5	d 7	d 10	d 12	d 15	d 17	d 20	d 22	d 23	d
Min.		30m		30m		30m		30m		30m		30m
Point.	h	m	h	m	h	m	h	m	h	m	h	m
South	12	12	12	12	12	12	12	12	12	12	12	12
s by w	0.30	0.28	0.27	0.25	0.24	0.22	0.21	0.19	0.17	0.16	0.15	
ss w	1.01	0.58	0.55	0.52	0.49	0.46	0.42	0.39	0.36	0.33	0.31	
sw by s	1.35	1.30	1.25	1.21	1.16	1.11	1.06	1.01	0.56	0.52	0.48	
s w	2.13	2.07	2.00	1.54	1.48	1.41	1.34	1.27	1.20	1.14	1.09	
sw by w	2.58	2.50	2.42	2.33	2.25	2.17	2.08	1.59	1.50	1.42	1.36	
w s w	3.51	3.41	3.31	3.21	3.11	3.01	2.50	2.39	2.28	2.18	2.11	
w by s	4.53	4.42	4.30	4.19	4.08	3.57	3.44	3.31	3.18	3.07	2.58	
West.	6.00	5.48	5.36	5.25	5.13	5.01	4.48	4.34	4.21	4.09	4.00	
w by n					6.23	6.12	5.59	5.46	5.33	5.21	5.13	
w n w									5.46	6.37	5.29	
☉ set.	6.00	6.09	6.17	6.26	6.35	6.44	6.54	7.04	7.14	7.22	7.29	
Sun's d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	
Amp.	0.00	3.18	6.38	9.57	13.18	16.40	20.4	22.25	26.57	29.46	31.54	

South Declination.

Deg.	0	d 2	d 5	d 7	d 10	d 12	d 15	d 17	d 20	d 22	d 23	d
Min.		30m		30m		30m		30m		30m		30m
Point.	h	m	h	m	h	m	h	m	h	m	h	m
South	12	12	12	12	12	12	12	12	12	12	12	12
s by w	0.30	0.31	0.33	0.34	0.36	0.37	0.39	0.40	0.42	0.44	0.45	
ss w	1.01	1.04	1.07	1.10	1.13	1.16	1.19	1.23	1.26	1.29	1.31	
sw by s	1.35	1.39	1.44	1.49	1.53	1.58	2.03	2.08	2.13	2.18	2.21	
s w	2.13	2.19	2.26	2.32	2.39	2.45	2.52	2.59	3.06	3.12	3.17	
sw by w	2.58	3.06	3.14	3.22	3.31	3.39	3.48	3.57	4.06	4.14	4.20	
w s w	3.51	4.01	4.11	4.21	4.30	4.40	4.51	5.02				
w by s	4.53	5.04	5.15	5.26								
West	6.00											
☉ set.	6.00	5.51	5.43	5.34	5.25	5.16	5.06	4.56	4.46	4.38	4.31	



## A Sun-Dial for the Latitude of 42 Degrees.

## North Declination.

Deg.	0	d 2	d 5	d 7	d 10	d 12	d 15	d 17	d 20	d 22	d 23	
Min.		30m		30m		30m		30m			30m	
Point.	h	m	h	m	h	m	h	m	h	m	h	m
South	12	12	12	12	12	12	12	12	12	12	12	
s by w	0.30	0.29	0.27	0.26	0.24	0.23	0.21	0.20	0.18	0.17	0.16	
ss w	1.02	0.59	0.56	0.53	0.50	0.47	0.44	0.41	0.37	0.34	0.32	
s w by s	1.36	1.32	1.27	1.23	1.18	1.14	1.09	1.04	0.58	0.54	0.51	
s w	2.15	2.09	2.03	1.56	1.50	1.44	1.37	1.30	1.23	1.17	1.13	
sw by w	3.00	2.52	2.44	2.36	2.28	2.20	2.12	2.03	1.54	1.46	1.40	
ws w	3.53	3.43	3.34	3.24	3.15	3.05	2.54	2.44	2.33	2.23	2.16	
w by s	4.54	4.43	4.32	4.21	4.10	4.00	3.47	3.36	3.23	3.12	3.03	
West.	5.00	5.49	5.37	5.26	5.15	5.03	4.51	4.39	4.25	4.13	4.04	
w by n					6.23	6.12	6.00	5.49	5.35	5.24	5.16	
w n w								6.58	6.47	6.37	6.30	
☉ let	5.00	6.09	6.18	6.27	6.37	6.46	6.56	7.06	7.17	7.25	7.32	
Sun's	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	
Amp.	0.00	3.21	6.44	10.6	13.31	16.57	20.23	23.52	27.24	30.16	32.27	

## South Declination.

Deg.	0	d 2	d 5	d 7	d 10	d 12	d 15	d 17	d 20	d 22	d 23	
Min.		30m		30m		30m		30m			30m	
Point.	h	m	h	m	h	m	h	m	h	m	h	m
South	12	12	12	12	12	12	12	12	12	12	12	12
s by w	0.30	0.32	0.33	0.35	0.36	0.38	0.39	0.41	0.43	0.44	0.45	
ss w	1.02	1.05	1.08	1.11	1.14	1.17	1.20	1.23	1.27	1.30	1.32	
sw by s	1.36	1.41	1.46	1.50	1.55	1.59	2.04	2.09	2.14	2.19	2.22	
s w	2.15	2.21	2.28	2.34	2.40	2.46	2.53	3.00	3.07	3.13	3.17	
swbw	3.00	3.08	3.16	3.24	3.32	3.40	3.49	3.57	4.07	4.14	4.20	
w s w	3.53	4.02	4.12	4.22	4.31	4.41	4.52					
w by s	4.45	5.04	5.15	5.26								
West	6.00											
☉ set	6.00	5.51	5.42	5.33	5.23	5.14	5.04	4.54	4.43	4.35	4.28	



A Sun-Dial for the Latitude of 43 Degrees.

North Declination.

Deg.	0	d 2	d 5	d 7	d 10	d 12	d 15	d 17	d 20	d 22	d 23
Min.		30m		30m		30m		30m			30m
Point.	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South	12	12	12	12	12	12	12	12	12	12	12
s by w	0.31	0.29	0.28	0.27	0.25	0.24	0.22	0.21	0.19	0.18	0.17
ss w	1.03	1.00	0.57	0.54	0.51	0.48	0.45	0.42	0.39	0.36	0.34
sw by s	1.38	1.34	1.29	1.24	1.20	1.15	1.11	1.06	1.01	0.57	0.53
s w	2.17	2.11	2.05	1.59	1.53	1.47	1.40	1.33	1.26	1.20	1.16
sw by w	3.02	2.55	2.47	2.39	2.31	2.23	2.15	2.07	1.58	1.50	1.44
w s w	3.55	3.46	3.36	3.27	3.18	3.08	2.58	2.48	2.37	2.28	2.21
w by s	4.55	4.45	4.34	4.23	4.13	4.03	3.51	3.40	3.27	3.17	3.09
West.	6.00	4.49	5.38	5.27	5.16	5.05	4.53	4.41	4.27	4.17	4.15
w by n					6.23	6.13	6.01	5.50	5.37	5.27	5.19
w n w								6.58	6.47	6.38	6.31
☉ set.	6.00	6.09	6.19	6.28	6.38	6.48	6.58	7.09	7.19	7.28	7.36
Sun's	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.
Amp.	0.00	3.25	6.51	10.17	13.44	17.12	20.43	24.16	27.53	30.48	33.2

South Declination.

Deg.	0	d 2	d 5	d 7	d 10	d 12	d 15	d 17	d 20	d 22	d 23
Min.		30m		30m		30m		30m			30m
Point.	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South	12	12	12	12	12	12	12	12	12	12	12
s by w	0.31	0.32	0.34	0.35	0.37	0.38	0.40	0.41	0.43	0.44	0.45
ss w	1.03	1.06	1.09	1.12	1.15	1.18	1.21	1.24	1.27	1.30	1.32
sw by s	1.38	1.42	1.47	1.52	1.56	2.01	2.05	2.10	2.15	2.19	2.23
s w	2.17	2.23	2.29	2.36	2.42	2.48	2.54	3.01	3.08	3.14	3.18
sw by w	3.02	3.10	3.18	3.26	3.33	3.41	3.50	3.58	4.07	4.14	4.20
w s w	3.55	4.04	4.14	4.23	4.32	4.42	4.52				
w by s	4.55	5.05	5.16	5.27							
West.	6.00										
☉ set.	6.00	5.51	5.41	5.32	5.22	5.12	5.02	4.51	4.41	4.32	4.24

*A Sun-Dial for the Latitude of 44 Degrees.*

## North Declination.

Deg.	0	d 2	d 5	d 7	d 10	d 12	d 15	d 17	d 20	d 22	d 23	d
Min.		30m		30m		30m		30m			30m	
Point.	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South	12	12		12	12	12	12	12	12	12	12	12
s by w	0.31	0.30	0.29	0.29	0.26	0.24	0.23	0.21	0.20	0.18	0.17	
s s w	1.04	1.01	0.58	0.56	0.53	0.50	0.47	0.44	0.40	0.38	0.36	
s w by s	1.40	1.35	1.31	1.27	1.22	1.18	1.13	1.08	1.03	0.59	0.56	
s w	2.19	2.13	2.07	2.01	1.55	1.49	1.43	1.36	1.29	1.24	1.20	
swb w	3.04	2.57	2.42	2.42	2.34	2.26	2.18	2.10	2.01	1.54	1.49	
w s w	3.57	3.48	3.38	3.29	3.21	3.12	3.02	2.52	2.41	2.33	2.26	
w by s	4.56	4.46	4.36	4.25	4.16	4.05	3.54	3.43	3.31	3.21	3.13	
West.	5.00	5.50	5.39	5.28	5.18	5.07	4.56	4.44	4.31	4.21	4.13	
w by r					6.23	6.13	6.02	5.51	5.39	5.29	5.21	
w n w								6.59	6.48	6.39	6.31	
☉ set	5.00	6.10	6.19	6.29	6.39	6.49	7.00	7.11	7.22	7.31	7.39	
Sun's	l.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	
Amp.	0.00	3.28	6.58	10.27	13.58	18.20	21.5	24.42	28.23	31.23	33.41	

## South Declination.

Deg.	0	d 2	d 5	d 7	d 10	d 12	d 15	d 17	d 20	d 22	d 23	d
Min.		30m		30m		30m		30m				m
Point.	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South	12	12	12	12	12	12	12	12	12	12	12	12
s by w	0.31	0.33	0.34	0.36	0.37	0.39	0.40	0.42	0.43	0.45	0.46	
s s w	1.04	1.07	1.10	1.13	1.16	1.19	1.22	1.25	1.28	1.31	1.33	
sw by s	1.40	1.44	1.48	1.53	1.57	2.02	2.06	2.11	2.16	2.20	2.23	
s w	2.19	2.25	2.31	2.37	2.43	2.49	2.56	3.02	3.09	3.14	3.19	
swb w	3.04	3.12	3.19	3.27	3.35	3.42	3.51	3.59	4.08	4.15	4.20	
w s w	3.57	4.06	4.15	4.24	4.33	4.42	4.52					
w by s	4.56	5.06	5.16	5.27								
West	6.00											
☉ set.	6.00	5.50	5.41	5.31	5.21	5.11	5.00	4.49	4.38	4.29	4.21	

A Sun-Dial for the Latitude of 45 Degrees.

North Declination.

Deg.	0 d	2 d	5 d	7 d	10 d	12 d	15 d	17 d	20 d	22 d	23 d
Min.		30m		30m		30m		30m		30m	
Point.	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South	12	12	12	12	12	12	12	12	12	12	12
s by w	0.32	0.31	0.29	0.28	0.26	0.25	0.24	0.22	0.20	0.19	0.18
s s w	1.05	1.03	1.00	0.57	0.54	0.51	0.48	0.45	0.42	0.39	0.37
sw by s	1.41	1.37	1.33	1.28	1.24	1.19	1.15	1.10	1.05	1.01	0.58
s w	2.21	2.15	2.09	2.03	1.58	1.53	1.45	1.39	1.33	1.27	1.23
swbw	3.06	2.59	2.52	2.45	2.37	2.29	2.22	2.13	2.05	1.58	1.53
w s w	3.59	3.50	3.41	3.32	3.23	3.14	3.05	2.55	2.45	2.37	2.30
w by s	4.57	4.47	4.38	4.28	4.18	4.08	3.57	3.46	3.35	3.26	3.18
West	6.00	5.50	5.40	5.30	5.19	5.09	4.58	4.46	4.35	4.25	4.17
w by n					6.24	6.14	6.03	5.52	5.41	5.31	5.24
w n w								6.58	6.48	6.40	6.33
nwbw											7.40
☉ set	6.00	6.10	6.20	6.30	6.41	6.51	7.02	7.13	7.25	7.35	7.43
Sun's	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.
Amp.	0.00	3.32	7.05	10.37	14.12	17.49	21.28	25.5	28.56	32.5	34.20

South Declination.

Deg.	0 d	2 d	5 d	7 d	10 d	12 d	15 d	17 d	20 d	22 d	23 d
Min.		30m		30m		30m		30m		30m	
Point.	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South	12	12	12	12	12	12	12	12	12	12	12
s by w	0.32	0.33	0.35	0.36	0.38	0.39	0.41	0.42	0.44	0.45	0.46
s s w	1.05	1.08	1.11	1.14	1.17	1.20	1.23	1.26	1.29	1.31	1.33
sw by s	1.41	1.45	1.50	1.54	1.58	2.03	2.07	2.12	2.17	2.21	2.24
s w	2.21	2.27	2.33	2.39	2.44	2.51	2.57	3.03	3.10	3.15	3.19
swbw	3.06	3.14	3.21	3.28	3.36	3.44	3.51	4.00	4.08	4.15	
w s w	3.59	4.07	4.16	4.25	4.34	4.43	4.52				
w by s	4.57	5.07	5.17	5.26							
West	6.00										
☉ set	6.00	5.50	5.40	5.30	5.19	5.09	4.58	4.47	4.35	4.25	4.17



*A Sun Dial for the Latitude of 46 Degrees.*

## North Declination.

Deg.	0 d	2 d	5 d	7 d	10 d	12 d	15 d	17 d	20 d	22 d	23 d
Min.		30m		30m		30m		30m			30m
Point	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South	12	12	12	12	12	12	12	12	12	12	12
s by w	0.33	0.31	0.30	0.29	0.27	0.26	0.24	0.23	0.21	0.20	0.19
s s w	1.06	1.04	1.01	0.58	0.55	0.52	0.49	0.46	0.43	0.41	0.39
s w by s	1.43	1.38	1.34	1.30	1.26	1.21	1.17	1.12	1.08	1.04	1.01
s w	2.23	2.17	2.11	2.06	2.00	1.54	1.48	1.42	1.36	1.30	1.26
s w by w	3.08	3.01	2.54	2.47	2.40	2.32	2.25	2.17	2.09	2.02	1.57
w s w	4.00	3.52	3.43	3.35	3.26	3.17	3.08	2.59	2.49	2.41	2.35
w by s	5.58	4.49	4.39	4.30	4.20	4.11	4.00	3.50	3.39	3.30	3.23
West	6.00	5.50	5.40	5.30	5.20	5.11	5.00	4.49	4.38	4.28	4.21
w by n					6.24	6.14	6.04	5.54	5.43	5.33	5.26
w n w								6.59	6.49	6.41	6.34
nw by w											7.40
☉ fet.	6.00	6.10	6.21	6.31	6.42	6.53	7.04	7.16	7.29	7.39	7.47
Sun's Amp.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.
	0.00	3.36	7.11	10.50	14.27	18.9	21.53	25.39	29.20	32.37	35.2

## South Declination:

Deg.	0 d	2 d	5 d	7 d	10 d	12 d	15 d	17 d	20 d	22 d	23 d
Min.		30m		30m		30m		30m			30m
point.	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South	12	12	12	12	12	12	12	12	12	12	12
s by w	0.33	0.34	0.35	0.37	0.38	0.40	0.41	0.42	0.44	0.45	0.46
s s w	1.06	1.09	1.12	1.15	1.18	1.20	1.23	1.26	1.29	1.32	1.34
s w by s	1.43	1.47	1.51	1.55	2.00	2.04	2.08	2.13	2.18	2.22	2.25
s w	2.23	2.29	2.34	2.40	2.46	2.52	2.58	3.04	3.10	3.16	3.20
sw by w	3.08	3.16	3.23	3.30	3.37	3.45	3.52	4.00	4.08	4.15	
w s w	4.00	4.09	4.17	4.26	4.34	4.43					
w by s	5.58	5.08	5.17	5.26							
West	6.00										
☉ fet.	5.00	5.50	5.39	5.29	5.18	5.07	4.56	4.44	4.31	4.21	4.13



A Sun-Dial for the Latitude of 47 Degrees.

North Declination.

Deg.	0	d	2	d	5	d	7	d	10	d	12	d	15	d	17	d	20	d	22	d	23	d
Min.			30m			30m			30m			30m			30m					30m		
Point	h	mh	h	mh	h	mh	h	mh	h	mh	h	mh	h	mh	h	mh	h	mh	h	mh	h	mh
South	12		12		12		12		12		12		12		12		12		12		12	
s by w	0.33		0.32		0.30		0.29		0.28		0.26		0.25		0.23		0.22		0.21		0.20	
ssw	1.07		1.05		1.02		0.99		0.96		0.94		0.91		0.88		0.85		0.82		0.80	
swbys	1.44		1.40		1.36		1.32		1.28		1.23		1.19		1.15		1.10		1.06		1.03	
sw	2.25		2.19		2.14		2.08		2.02		1.97		1.91		1.85		1.79		1.73		1.69	
swbw	3.10		3.03		2.96		2.89		2.82		2.75		2.68		2.60		2.54		2.48		2.41	
ws w	4.02		3.54		3.46		3.37		3.29		3.20		3.12		3.03		2.93		2.85		2.79	
w by s	4.59		4.50		4.41		4.32		4.23		4.13		4.03		3.93		3.83		3.74		3.67	
West.	6.00		5.51		5.41		5.32		5.22		5.12		5.03		4.94		4.84		4.74		4.67	
w by n							6.34		6.25		6.15		6.05		5.95		5.84		5.74		5.67	
w n w													7.08		6.59		6.49		6.42		6.35	
nwbw																					7.40	
☉ set.	6.00		6.11		6.22		6.33		6.44		6.55		7.07		7.20		7.32		7.43		7.51	
Sun's	d.m.		d.m.		d.m.		d.m.		d.m.		d.m.		d.m.		d.m.		d.m.		d.m.		d.m.	
Amp.	0.00		3.40		7.21		11.2		14.45		18.30		22.18		26.10		30.7		33.19		35.48	

South Declination.

Deg.	0	d	2	d	5	d	7	d	10	d	12	d	15	d	17	d	20	d	22	d	23	d
Min.			30m			30m			30m			30m			30m					30m		
Point	h	mh	h	mh	h	mh	h	mh	h	mh	h	mh	h	mh	h	mh	h	mh	h	mh	h	mh
South	12		12		12		12		12		12		12		12		12		12		12	
s by w	0.33		0.34		0.36		0.37		0.38		0.40		0.41		0.43		0.44		0.45		0.46	
ssw	1.07		1.10		1.13		1.16		1.18		1.21		1.24		1.27		1.30		1.32		1.34	
swbys	1.44		1.48		1.52		1.57		2.01		2.05		2.09		2.14		2.18		2.22		2.25	
sw	2.25		2.30		2.36		2.41		2.47		2.53		2.59		3.05		3.11		3.16		3.20	
swbw	3.10		3.17		3.24		3.31		3.38		3.45		3.53		4.00		4.07		4.15			
ws w	4.02		4.10		4.18		4.26		4.35		4.43											
w by s	4.59		5.08		5.17																	
West.	6.00																					
☉ set.	6.00		5.49		5.38		5.27		5.16		5.05		4.53		4.40		4.28		4.17		4.05	

*A Sun Dial for the Latitude of 48 Degrees.*

## North Declination.

Deg.	0	d 2	d 5	d 7	d 10	d 12	d 15	d 17	d 20	d 22	d 23
Min.		30m		30m		30m		30m			30m
Point.	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South	12	12	12	12	12	12	12	12	12	12	12
s by w	0.34	0.32	0.31	0.30	0.28	0.27	0.26	0.24	0.23	0.22	0.21
s s w	1.08	1.06	1.03	1.00	0.58	0.55	0.52	0.49	0.46	0.44	0.42
s w by s	1.46	1.42	1.38	1.34	1.30	1.25	1.21	1.17	1.12	1.08	1.05
s w	2.26	2.21	2.16	2.10	2.05	1.55	1.53	1.47	1.41	1.36	1.32
s w by w	3.12	3.05	2.59	2.52	2.45	2.39	2.31	2.23	2.16	2.09	2.04
w s w	4.03	3.56	3.48	3.40	3.32	3.23	3.15	3.06	2.57	2.49	2.43
w by s	5.00	4.51	4.43	4.34	4.25	4.16	4.06	3.56	3.46	3.38	3.31
West	6.00	5.51	5.42	5.33	5.23	5.14	5.04	4.54	4.43	4.35	4.28
w by n					6.25	6.16	6.06	5.56	5.46	5.38	5.31
w n w							7.08	6.59	6.50	6.42	6.36
n w by w										7.45	7.40
☉ fet.	6.00	6.11	6.22	6.33	6.45	6.57	7.09	7.22	7.35	7.47	7.56
Sun's	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.
Amp.	0.00	3.40	7.29	11.15	15.2	18.52	22.45	26.43	30.45	34.3	36.34

## South Declination.

Deg.	0	d 2	d 5	d 7	d 10	d 12	d 15	d 17	d 20	d 22	d 23
Min.		30m		30m		30m		30m			30m
Point.	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South	12	12	12	12	12	12	12	12	12	12	12
s by w	0.34	0.35	0.36	0.38	0.39	0.40	0.42	0.43	0.45	0.47	0.49
s s w	1.08	1.11	1.14	1.16	1.19	1.22	1.25	1.28	1.31	1.33	1.35
s w by s	1.46	1.50	1.54	1.58	2.02	2.06	2.10	2.15	2.19	2.23	2.26
s w	2.26	2.32	2.37	2.43	2.48	2.54	3.00	3.05	3.12	3.17	3.21
sw by w	3.12	3.19	3.26	3.32	3.39	3.45	3.53	4.01	4.09		
w s w	4.03	4.11	4.19	4.27	4.35	4.44					
w by s	5.00	5.09	5.17	5.26							
West	6.00										
☉ fet.	5.00	5.49	5.38	5.27	5.15	5.03	4.51	4.38	4.25	4.13	4.04

A Sun-Dial for the Latitude of 49 Degrees.

North Declination.

Deg.	0	d 2	d 5	d 7	d 10	d 12	d 15	d 17	d 20	d 22	d 23	d
Min.		30m		30m		30m		30m		30m		30m
Point.	h	mh	mh	mh	mh	mh	mh	mh	mh	mh	mh	m
South	12	12	12	12	12	12	12	12	12	12	12	
s by w	0.34	0.33	0.32	1.30	0.29	0.28	0.26	0.25	0.23	0.22	0.21	
ssw	1.09	1.07	1.04	1.02	0.59	0.56	0.53	0.51	0.48	0.45	0.43	
sw by s	1.47	1.43	1.39	1.35	1.31	1.27	1.23	1.19	1.14	1.11	1.08	
s w	2.28	2.23	2.18	2.12	2.07	2.01	1.56	1.50	1.44	1.39	1.35	
swbw	3.14	3.07	3.01	2.54	2.48	2.41	2.34	2.27	2.19	2.13	2.08	
ws w	4.05	3.57	3.50	3.42	3.34	3.26	3.18	3.09	3.00	2.53	2.47	
w by s	5.01	4.53	4.44	4.36	4.27	4.18	4.09	4.00	3.50	3.42	3.35	
West.	6.07	5.51	5.42	5.34	5.25	5.16	5.06	4.56	4.46	4.38	4.31	
w by n				6.34	6.25	6.16	6.07	5.58	5.48	5.40	5.33	
w n w							7.08	7.00	6.51	6.43	6.38	
nwbw										7.45	7.40	
☉ set.	6.00	6.11	6.23	6.35	6.47	6.59	7.12	7.25	7.39	7.51	8.00	
Sun's	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	
1 mp.	0.00	3.48	7.38	11.23	15.21	19.15	23.14	27.17	31.25	34.48	37.26	

South Declination.

Deg.	0	d 2	d 5	d 7	d 10	d 12	d 15	d 17	d 20	d 22	d 23	d
Min.		30m		30m		30m		30m		30m		30m
Point.	h	mh	mh	mh	mh	mh	mh	mh	mh	mh	mh	m
South	12	12	12	12	12	12	12	12	12	12	12	
s by w	0.34	0.35	0.37	0.38	0.39	0.41	0.42	0.43	0.45	0.46	0.47	
ssw	1.09	1.12	1.15	1.17	1.20	1.23	1.25	1.28	1.31	1.33	1.35	
sw by s	1.47	1.51	1.55	1.59	2.03	2.07	2.11	2.15	2.20	2.23	2.26	
s w	2.28	2.33	2.39	2.44	2.49	2.54	3.00	3.06	3.12	3.17	3.21	
swbw	3.14	3.20	3.27	3.34	3.40	3.47	3.54	4.01	4.09			
ws w	4.05	4.13	4.20	4.28	4.36	4.44						
w by s	5.01	5.09	5.18									
West.	6.07											
☉ set.	5.00	5.49	5.37	5.25	5.13	5.01	4.48	4.35	4.21	4.09	4.00	

*A Sun-Dial for the Latitude of 50 Degrees.*

## North Declination.

Deg.	0	d 2	d 5	d 7	d 10	d 12	d 15	d 17	d 20	d 22	d 23	d
Min.		30m		30m		30m		30m		30m		30m
Point	h	m	h	m	h	m	h	m	h	m	h	m
South	12	12	12	12	12	12	12	12	12	12	12	
s by w	0.35	0.33	0.32	0.31	0.30	0.28	0.27	0.26	0.24	0.23	0.22	
ss w	1.10	1.08	1.05	1.03	1.00	0.55	0.55	0.52	0.49	0.47	0.45	
sw by s	1.48	1.45	1.41	1.37	1.33	1.26	1.25	1.21	1.16	1.13	1.10	
s w	2.30	2.25	2.20	2.15	2.09	2.04	1.58	1.53	1.47	1.42	1.38	
swbw	3.16	3.09	3.03	2.56	2.50	2.43	2.36	2.30	2.23	2.16	2.12	
ws w	4.06	3.59	3.51	3.44	3.36	3.29	3.21	3.13	3.04	2.57	2.51	
w by s	5.02	4.54	4.45	4.37	4.29	4.20	4.12	4.03	3.53	3.45	3.39	
West	6.00	5.52	5.43	5.34	5.26	5.17	5.08	4.59	4.49	4.41	4.34	
w by n				6.34	6.25	6.17	6.08	5.59	5.49	5.42	5.36	
wn w							7.08	7.00	6.51	6.44	6.39	
nwbw										7.45	7.41	
☉ fet	6.00	6.12	6.24	6.36	6.49	7.01	7.14	7.28	7.43	7.55	8.05	
Sun's	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	
Amp.	0.00	3.53	7.48	11.43	15.40	19.43	23.44	27.53	32.09	35.40	38.20	

## South Declination.

Deg.	0	d 2	d 5	d 7	d 10	d 12	d 15	d 17	d 20	d 22	d 23	d
Min.		30m		30m		30m		30m		30m		30m
Point	h	m	h	m	h	m	h	m	h	m	h	m
South	12	12	12	12	12	12	12	12	12	12	12	
s by w	0.35	0.36	0.37	0.38	0.40	0.41	0.42	0.44	0.45	0.46	0.47	
ss w	1.10	1.13	1.15	1.18	1.21	1.23	1.26	1.29	1.32	1.34	1.36	
sw by s	1.48	1.52	1.56	2.00	2.04	2.08	2.12	2.16	2.20	2.24	2.27	
s w	2.30	2.35	2.40	2.45	2.50	2.56	3.01	3.07	3.13	3.17	3.21	
swbw	3.16	3.22	3.28	3.35	3.41	3.48	3.55	4.02	4.09			
ws w	4.06	4.14	4.21	4.29	4.36	4.44						
w by s	5.02	5.10	5.18									
West	6.00											
☉ fet	6.00	5.48	5.36	5.24	5.11	4.59	4.46	4.32	4.17	4.05	3.55	



# The Mariners Compass Rectified.

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## A Sun-Dial for the Latitude of 51 Degrees.

### North Declination.

Deg.	0	d 2	d 5	d 7	d 10	d 12	d 15	d 17	d 20	d 22	d 23
Min.		30m		30m		30m		30m		30m	
Point.	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South	12	12	12	12	12	12	12	12	12	12	12
s by w	0.35	0.34	0.33	0.31	0.30	0.29	0.28	0.26	0.25	0.24	0.23
ss w	1.11	1.09	1.06	1.04	1.01	0.99	0.96	0.93	0.91	0.88	0.87
sw by s	1.50	1.46	1.42	1.39	1.35	1.31	1.27	1.23	1.19	1.15	1.12
s w	2.31	2.26	2.21	2.16	2.11	2.06	2.01	1.95	1.90	1.85	1.81
s w by w	3.17	3.11	3.05	2.99	2.92	2.86	2.79	2.73	2.66	2.60	2.55
w s w	4.08	4.01	3.93	3.86	3.79	3.71	3.64	3.56	3.48	3.41	3.35
w by s	5.03	4.95	4.87	4.79	4.71	4.62	4.54	4.45	4.36	4.28	4.21
West.	6.00	5.52	5.44	5.35	5.27	5.18	5.10	5.01	4.91	4.82	4.73
w by n				6.34	6.26	6.17	6.09	6.00	5.91	5.82	5.73
w n w							7.08	7.00	6.92	6.83	6.74
nw by w										7.45	7.41
☉ fet.	6.00	5.13	6.25	6.38	6.50	7.03	7.17	7.32	7.47	8.00	8.10
Sun's	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.
Amp.	0.00	3.58	7.58	11.58	16.1	2.08	24.17	28.33	32.55	36.32	39.20

### South Declination.

Deg.	0	d 2	d 5	d 7	d 10	d 12	d 15	d 17	d 20	d 22	d 23
Min.		30m		30m		30m		30m		30m	
Point.	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South	12	12	12	12	12	12	12	12	12	12	12
s by w	0.35	0.36	0.38	0.39	0.40	0.41	0.43	0.44	0.46	0.47	0.48
ss w	1.11	1.14	1.16	1.19	1.21	1.24	1.27	1.29	1.32	1.34	1.36
sw by s	1.50	1.53	1.57	2.01	2.05	2.09	2.13	2.17	2.21	2.24	2.27
s w	2.31	2.36	2.41	2.46	2.52	3.57	3.02	3.07	3.13	3.18	3.21
s w by w	3.17	3.23	3.30	3.36	3.42	3.49	3.55	4.02	4.09		
w s w	4.08	4.15	4.22	4.29	4.37	4.44					
sw by s	5.03	5.10	5.18								
West.	6.00										
☉ fet.	6.00	5.47	5.35	5.22	5.10	4.57	4.43	4.28	4.13	4.00	3.50

## A Sun-Dial for the Latitude of 52 Degrees.

## North Declination.

Deg.	0	d 2	d 5	d 7	d 10	d 12	d 15	d 17	d 20	d 22	d 23	d
Min.		30m		30m		30m		30m			30m	
Point.	h	m	h	m	h	m	h	m	h	m	h	m
South	12	12	12	12	12	12	12	12	12	12	12	
s by w	0.36	0.34	0.33	0.32	0.31	0.30	0.28	0.27	0.26	0.25	0.24	
ss w	1.12	1.10	1.08	1.05	1.03	1.00	0.57	0.55	0.52	0.50	0.48	
sw by s	1.51	1.47	1.44	1.40	1.36	1.33	1.29	1.25	1.21	1.17	1.15	
s w	2.33	2.28	2.23	2.18	2.13	2.08	2.03	1.58	1.52	1.48	1.44	
swbw	3.19	3.13	3.07	3.01	2.55	2.48	2.42	2.36	2.29	2.24	2.19	
w s w	4.09	4.04	3.55	3.48	3.41	3.34	3.26	3.19	3.11	3.04	2.59	
w by s	5.03	4.56	4.48	4.40	4.33	4.25	4.16	4.08	3.59	3.52	3.46	
West.	6.00	5.52	5.44	5.36	5.28	5.20	5.12	5.03	4.54	4.46	4.40	
w by n				6.33	6.26	6.18	6.10	6.01	5.53	5.45	5.40	
w n w							7.08	7.00	6.53	6.46	6.41	
nw bw										7.45	7.40	
☉ fet.	6.00	6.13	6.26	6.39	6.52	7.06	7.20	7.35	7.51	8.05	8.16	
Sun's	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	
Amp.	0.00	4.03	8.08	12.14	16.23	20.40	24.51	29.15	33.46	37.29	40.21	

## South Declination.

Deg.	0	d 2	d 5	d 7	d 10	d 12	d 15	d 17	d 20	d 22	d 23	d
Min.		30m		30m		30m		30m			30m	
Point.	h	m	h	m	h	m	h	m	h	m	h	m
South	12	12	12	12	12	12	12	12	12	12	12	
s by w	0.36	0.37	0.38	0.39	0.41	0.42	0.43	0.44	0.46	0.47	0.48	
ss w	1.12	1.15	1.17	1.20	1.22	1.25	1.27	1.30	1.33	1.35	1.37	
sw by s	1.51	1.55	1.58	2.02	2.06	2.10	2.13	2.17	2.22	2.25	2.28	
s w	2.33	2.38	2.43	2.48	2.53	2.58	3.03	3.08	3.13	3.18	3.22	
swbw	3.19	3.25	3.31	3.37	3.43	3.49	3.56	4.02	4.10			
w s w	4.09	4.16	4.23	4.30	4.37	4.44						
sw by s	5.03	5.11	5.19									
West.	6.00											
☉ fet.	6.00	5.47	5.34	5.21	5.08	4.54	4.40	4.25	4.09	3.55	3.44	

A Sun Dial for the Latitude of 53 Degrees.

North Declination.

Deg.	0	d 2	d 5	d 7	d 10	d 12	d 15	d 17	d 20	d 22	d 23
Min.		30m		30m		30m		30m			30m
Point.	h	m	h	m	h	m	h	m	h	m	h
South	12	12	12	12	12	12	12	12	12	12	12
s by w	0.36	0.35	0.34	0.33	0.31	0.30	0.29	0.28	0.26	0.25	0.24
s s w	1.13	1.11	1.08	1.06	1.04	1.01	0.59	0.56	0.53	0.51	0.50
sw by s	1.52	.49	1.45	1.41	1.38	1.34	1.31	1.27	1.23	1.19	1.17
s w	2.34	.30	2.25	2.20	2.15	2.10	2.05	2.00	1.55	1.51	1.47
sw by w	3.20	3.15	3.09	3.03	2.57	2.51	2.45	2.38	2.32	2.26	2.22
w s w	4.10	4.04	3.57	3.50	3.43	3.36	3.29	3.22	3.14	3.08	3.03
w by s	5.04	4.57	4.49	4.42	4.34	4.27	4.19	4.11	4.02	3.55	3.50
West.	6.00	5.52	5.45	5.37	5.29	5.22	5.15	5.05	4.56	4.49	4.43
w by n				6.34	6.26	6.19	6.11	6.03	5.54	5.47	5.42
w n w							7.08	7.01	6.53	6.47	6.42
nw by w									7.51	7.46	7.43
☉ set	6.00	5.14	6.27	6.41	6.54	7.08	7.23	7.39	7.56	8.10	8.21
Sun's d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.
Amp.	0.00	4.09	8.19	12.31	16.46	21.52	25.28	29.59	34.39	38.31	41.29

South Declination.

Deg.	0	d 2	d 5	d 7	d 10	d 12	d 15	d 17	d 20	d 22	d 23
Min.		30m		30m		30m		30m			30m
Point.	h	m	h	m	h	m	h	m	h	m	h
South	12	12	12	12	12	12	12	12	12	12	12
s by w	0.36	0.37	0.38	0.40	0.41	0.42	0.43	0.45	0.46	0.47	0.48
s s w	1.13	1.16	1.18	1.20	1.23	1.25	1.28	1.30	1.33	1.35	1.37
sw by s	1.52	1.56	2.00	2.03	2.07	2.10	2.14	2.18	2.22	2.25	2.28
s w	2.34	2.39	2.44	2.49	2.54	2.58	3.03	3.09	3.14	3.18	3.22
sw by w	3.20	3.26	3.32	3.38	3.44	3.50	3.56	4.02			
w s w	4.10	4.17	4.24	4.30	4.37	4.44					
w by s	5.04	5.11	5.19								
West.	6.00										
☉ set	6.00	5.46	5.33	5.19	5.06	4.52	4.37	4.21	4.04	3.50	3.39

*A Sun-Dial for the Latitude of 54 Degrees.*

## North Declination.

Deg.	0	d 2	d 5	d 7	d 10	d 12	d 15	d 17	d 20	d 22	d 23	
Min.		30m		30m		30m		30m			30m	
Point.	h	m	h	m	h	m	h	m	h	m	h	m
South	12	12	12	12	12	12	12	12	12	12	12	
s by w	0.37	0.35	0.34	0.33	0.32	0.31	0.29	0.28	0.27	0.26	0.25	
s s w	1.14	1.12	1.09	1.07	1.05	1.02	1.00	0.57	0.55	0.53	0.51	
s w by s	1.54	1.50	1.47	1.43	1.40	1.36	1.32	1.29	1.25	1.22	1.19	
s w	2.36	2.31	2.27	2.22	2.17	2.12	2.08	2.03	1.57	1.53	1.50	
sw by w	3.22	3.16	3.11	3.05	2.59	2.53	2.47	2.41	2.35	2.29	2.25	
w s w	4.12	4.05	3.59	3.52	3.45	3.39	3.32	3.24	3.17	3.11	3.06	
w by s	5.05	4.58	4.51	4.43	4.36	4.29	4.21	4.13	4.05	3.58	3.53	
West.	6.00	5.53	5.45	5.38	5.31	5.23	5.15	5.07	4.59	4.52	4.46	
w by n				5.34	5.27	5.19	5.12	5.04	4.56	4.49	4.44	
w n w							7.09	7.01	6.54	6.48	6.43	
n w by w									7.51	7.46	7.41	
☉ set.	6.00	6.14	6.28	6.42	6.50	7.11	7.27	7.43	8.00	8.15	8.27	
Sun's	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	
Amp.	0.00	4.12	8.32	12.49	17.11	21.36	25.71	30.45	35.55	39.37	42.43	

## South Declination.

Deg.	0	d 2	d 5	d 7	d 10	d 12	d 15	d 17	d 20	d 22	d 23	
Min.		30m		30m		30m		30m			30m	
Point.	h	m	h	m	h	m	h	m	h	m	h	m
South	12	12	12	12	12	12	12	12	12	12	12	
s by w	0.37	0.38	0.39	0.40	0.41	0.42	0.44	0.45	0.46	0.47	0.48	
s s w	1.14	1.16	1.19	1.21	1.24	1.26	1.28	1.31	1.33	1.35	1.37	
sw by s	1.54	1.57	2.01	2.04	2.08	2.11	2.15	2.19	2.23	2.26	2.28	
s w	2.36	2.41	2.45	2.50	2.54	2.59	3.04	3.06	3.15	3.19	3.22	
sw by w	3.22	3.27	3.33	3.39	3.44	3.50	3.56	4.03				
w s w	4.12	4.18	4.24	4.31	4.38	4.45						
w by s	5.05	5.12	5.19									
West.	6.00											
☉ set.	6.00	5.46	5.32	5.18	5.04	4.49	4.33	4.17	4.00	3.45	3.33	



A Sun Dial for the Latitude of 55 Degrees.

North Declination.

Deg.	0	d 2	d 5	d 7	d 10	d 12	d 15	d 17	d 20	d 22	d 23
Min.		30m		30m		30m		30m			30m
Point.	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South	12	12	12	12	12	12	12	12	12	12	12
s by w	0.37	0.36	0.35	0.34	0.33	0.31	0.30	0.29	0.28	0.27	0.26
s s w	1.15	1.13	1.10	1.08	1.06	1.03	1.01	0.59	0.56	5.54	0.52
sw by s	1.55	1.51	1.48	1.45	1.41	1.38	1.34	1.30	1.27	1.23	1.21
s w	2.37	2.33	2.28	2.24	2.19	2.14	2.10	2.05	2.00	1.55	1.52
swbw	3.23	3.18	3.12	3.07	3.01	2.56	2.50	2.44	2.38	2.33	2.29
w s w	5.13	4.06	4.00	3.54	3.47	3.41	3.34	3.27	3.20	3.14	3.10
w by s	5.06	4.59	4.52	4.45	4.38	4.31	4.23	4.16	4.08	4.02	3.56
West.	6.00	5.53	5.46	5.39	5.32	5.24	5.17	5.09	5.01	4.54	4.49
w by n					6.27	6.20	6.13	6.05	5.57	5.51	5.46
w n w							7.09	7.02	6.55	6.49	6.44
nwbw									7.51	7.46	7.42
☉ set	6.00	6.14	6.29	6.43	6.58	7.14	7.30	7.47	8.05	8.21	8.34
Sun's d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.
Amp.	0.00	1.21	1.45	1.3.9	17.37	22.10	26.49	31.42	36.36	40.46	44.2

South Declination.

Deg.	0	d 2	d 5	d 7	d 10	d 12	d 15	d 17	d 20	d 22	d 23
Min.		30m		30m		30m		30m			30m
Point.	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South	12	12	12	12	12	12	12	12	12	12	12
s by w	0.37	0.38	0.39	0.40	0.42	0.43	0.44	0.45	0.46	0.47	0.48
s s w	1.15	1.17	1.20	1.22	1.24	1.26	1.29	1.31	1.34	1.36	1.38
sw by s	1.55	1.58	2.01	2.05	2.08	2.12	2.16	2.19	2.23	2.26	2.29
s w	2.37	2.42	2.46	2.51	2.55	3.00	3.05	3.10	3.15	3.19	3.22
swbw	3.23	3.29	3.34	3.40	3.45	3.51	3.57	4.03			
w s w	4.13	4.19	4.25	4.32	4.38	4.45					
w by s	5.06	5.12	5.19								
West.	6.00										
☉ set	6.00	5.46	5.31	5.17	5.02	4.46	4.30	4.13	3.55	3.39	3.26

*A Sun-Dial for the Latitude of 56 Degrees.*

## North Declination.

Deg.	0	d 2	d 5	d 7	d 10	d 12	d 15	d 17	d 20	d 22	d 23	d
Min.		30m		30m		30m		30m			30m	
Point.	h	m	h	m	h	m	h	m	h	m	h	m
South	12	12	12	12	12	12	12	12	12	12	12	
s by w	0.37	0.36	0.35	0.34	0.33	0.32	0.31	0.30	0.28	0.27	0.26	
ss w	1.16	1.14	1.11	1.09	1.07	1.05	1.02	1.00	0.57	0.55	0.53	
sw by s	1.56	1.53	1.49	1.46	1.43	1.39	1.36	1.32	1.28	1.26	1.23	
s w	2.39	2.34	2.30	2.26	2.21	2.16	2.12	2.07	2.02	1.59	1.55	
sw by w	3.25	3.19	3.14	3.09	3.03	2.58	2.52	2.46	2.40	2.36	2.32	
w s w	4.14	4.08	4.02	3.56	3.50	3.43	3.37	3.30	3.23	3.17	3.12	
w by s	5.06	4.00	4.53	4.46	4.40	4.33	4.26	4.14	4.11	4.05	4.00	
West.	5.00	5.53	5.46	5.39	5.32	5.26	5.18	5.11	5.03	4.57	4.52	
w by n				6.34	6.28	6.21	6.14	6.06	5.59	5.53	5.48	
w n w						7.15	7.09	7.02	6.55	6.50	6.45	
nw by w									7.51	7.46	7.43	
☉ fet.	6.00	6.15	6.30	6.45	7.00	7.16	7.34	7.52	8.10	8.27	8.41	
Su n's	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	
Amp.	0.00	4.28	8 58	13.29	18.6	22.46	27.24	32.32	37.42	42.4	45.30	

## South Declination.

Deg.	0	d 2	d 5	d 7	d 10	d 12	d 15	d 17	d 20	d 22	d 23	d
Min.		30m		30m		30m		30m			30m	
Point.	h	m	h	m	h	m	h	m	h	m	h	m
South	12	12	12	12	12	12	12	12	12	12	12	
s by w	0.37	0.39	0.40	0.41	0.42	0.43	0.44	0.45	0.47	0.48	0.49	
ss w	1.16	1.18	1.20	1.22	1.25	1.27	1.29	1.32	1.34	1.36	1.38	
sw by s	1.56	1.59	2.02	2.06	2.09	2.13	2.16	2.20	2.24	2.26	2.29	
s w	2.39	2.43	2.47	2.52	2.57	3.01	3.06	3.10	3.15	3.19		
sw by w	3.25	3.30	3.35	3.40	3.46	3.51	3.57	4.03				
w s w	4.14	4.20	4.26	4.32	4.38							
w by s	5.06	5.13	5.19									
West.	6.00											
☉ fet.	6.00	5.45	5.30	5.15	5.00	4.44	4.26	4.08	3.50	3.33	3.19	

A Sun-Dial for the Latitude of 57 Degrees.

North Declination.

Deg.	0	d 2	d 5	d 7	d 10	d 12	d 15	d 17	d 20	d 22	d 23
Min.		30m		30m		30m		30m			30m
Point.	h	m	h	m	h	m	h	m	h	m	h
South	12	12	12	12	12	12	12	12	12	12	12
s by w	0.38	0.37	0.36	0.35	0.34	0.32	0.31	0.30	0.29	0.28	0.27
s s w	1.17	1.14	1.12	1.10	1.08	1.06	1.04	1.01	0.59	0.57	0.55
s w by s	1.57	1.54	1.51	1.47	1.44	1.41	1.37	1.34	1.30	1.27	1.25
s w	2.40	2.36	2.32	2.24	2.23	2.18	2.14	2.10	2.05	2.01	1.58
swbw	3.26	3.21	3.16	3.11	3.05	3.00	2.55	2.49	2.43	2.38	2.35
w s w	4.15	4.09	4.03	3.57	3.51	3.45	3.39	3.33	3.26	3.20	3.16
w by s	5.07	5.00	4.54	4.47	4.41	4.34	4.28	4.21	4.13	4.07	4.03
West.	6.00	5.53	5.47	5.40	5.33	5.27	5.20	5.13	5.05	4.59	4.54
w by n				6.34	6.28	6.21	6.14	6.07	6.00	5.54	5.50
w n w						7.15	7.09	7.03	6.56	6.51	6.46
nwbw									7.52	7.47	7.43
n w											8.30
☉ fet.	6.00	6.16	6.31	6.47	7.03	7.20	7.38	7.56	8.16	8.34	8.48
Sun's	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.
Amp.	0.00	4.35	9.13	13.52	18.36	23.24	28.22	33.31	38.53	43.27	47.2

South Declination

Deg.	0	d 2	d 5	d 7	d 10	d 12	d 15	d 17	d 20	d 22	d 23
Min.		30m		30m		30m		30m			30m
Point.	h	m	h	m	h	m	h	m	h	m	h
South	12	12	12	12	12	12	12	12	12	12	12
s by w	0.38	0.39	0.40	0.41	0.42	0.43	0.44	0.46	0.47	0.48	0.49
s s w	1.17	1.19	1.21	1.23	1.25	1.27	1.30	1.32	1.34	1.36	1.38
s w by s	1.57	2.00	2.03	2.07	2.10	2.13	2.17	2.20	2.24	2.27	2.29
s w	2.40	2.44	2.48	2.53	2.57	3.02	3.06	3.10	3.15	3.19	
swbw	3.26	3.31	3.36	3.41	3.46	3.53	3.57	4.03			
w s w	4.15	4.21	4.26	4.32	4.38						
w by s	5.07	5.13	5.19								
West.	6.00										
☉ fet.	6.00	6.44	6.29	5.13	4.57	4.40	4.22	4.04	3.44	3.26	3.12



## A Sun Dial for the Latitude of 58 Degrees.

## North Declination.

Deg.	0 d	2 d	5 d	7 d	10 d	12 d	15 d	17 d	20 d	22 d	23 d
Min.		30m		30m		30m		30m			30m
Point.	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South	12	12	12	12	12	12	12	12	12	12	12
s by w	0.38	0.37	0.36	0.35	0.34	0.33	0.32	0.31	0.30	0.29	0.28
s s w	1.17	1.15	1.13	1.11	1.09	1.07	1.05	1.02	1.00	0.58	0.57
s w by s	1.58	1.55	1.52	1.49	1.46	1.42	1.39	1.35	1.32	1.29	1.27
s w	1.41	2.37	2.33	2.29	2.25	2.21	2.16	2.12	2.07	2.04	2.01
s w b w	3.27	3.22	3.17	3.12	3.07	3.02	2.57	2.51	2.46	2.41	2.38
w s w	4.16	4.10	4.05	3.59	3.53	3.47	3.41	3.35	3.29	3.23	3.19
w by s	5.07	5.01	4.55	4.49	4.43	4.36	4.30	4.23	4.16	4.10	4.06
West	6.00	5.54	5.47	5.41	5.35	5.28	5.21	5.15	5.08	5.02	4.57
w by n				6.34	6.28	6.22	6.15	6.08	6.02	5.56	5.51
w n w						7.16	7.10	7.03	6.57	6.52	6.48
n w b w								7.57	7.52	7.47	7.44
n w											8.38
☉ fet	6.00	6.16	6.32	6.49	7.06	7.24	7.42	8.01	8.22	8.41	8.56
sun's	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.
Amp.	0.00	4.39	2.28	14.16	19.8	24.6	29.14	34.24	40.12	44.59	48.49

## South Declination.

Deg.	0 d	2 d	5 d	7 d	10 d	12 d	15 d	17 d	20 d	22 d	23 d
Min.		30m		30m		30m		30m			30m
point.	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South	12	12	12	12	12	12	12	12	12	12	12
s by w	0.38	0.39	0.40	0.41	0.43	0.44	0.45	0.46	0.47	0.48	0.49
s s w	1.17	1.19	1.22	1.24	1.26	1.28	1.30	1.32	1.35	1.37	1.38
s w by s	1.58	2.01	2.04	2.07	2.10	2.14	2.17	2.21	2.24	2.27	2.29
s w	2.41	2.45	2.49	2.53	2.57	3.02	3.06	3.10	3.15	3.19	
s w b w	3.27	3.32	3.37	3.42	3.47	3.52	3.57				
w s w	4.16	4.21	4.27	4.33	4.38						
w by s	5.07	5.13	5.19								
West	6.00										
☉ fet	5.00	5.44	5.28	5.11	4.54	4.36	4.18	3.59	3.38	3.19	3.04



*A Sun-Dial for the Latitude of 59 Degrees.*

North Declination.

Deg.	0 d	2 d	5 d	7 d	10 d	12 d	15 d	17 d	20 d	22 d	23 d
Min.		30m		30m		30m		30m			30m
Point.	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South	12	12	12	12	12	12	12	12	12	12	12
s by w	0.39	0.38	0.37	0.36	0.35	0.34	0.32	0.31	0.30	0.29	0.28
s s w	1.18	1.16	1.14	1.12	1.10	1.08	1.06	1.04	1.01	1.00	0.58
sw by s	1.59	1.56	1.53	1.50	1.47	1.44	1.41	1.38	1.34	1.31	1.29
s w	2.42	2.38	2.35	2.31	2.27	2.23	2.19	2.14	2.10	2.06	2.03
s w b w	3.28	3.24	3.19	3.14	3.09	3.04	2.59	2.54	2.49	2.44	2.41
w s w	4.17	4.11	4.06	4.01	3.55	3.49	3.43	3.38	3.32	3.26	3.22
w by s	5.08	5.02	4.56	4.50	4.44	4.38	4.32	4.25	4.19	4.13	4.09
West.	6.00	5.54	5.48	5.42	5.36	5.29	5.23	5.16	5.09	5.04	4.59
w by n				6.35	6.29	6.22	6.16	6.10	6.03	5.58	5.53
w n w						7.16	7.10	7.04	6.58	6.53	6.49
n w b w								7.57	7.52	7.48	7.44
n w										8.43	8.38
☉ fet.	6.00	6.16	6.33	6.50	7.08	7.27	7.46	8.77	8.29	8.49	9.05
Sun's	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.
Amp.	0.00	4.51	9.45	14.41	19.42	24.51	30.10	35.43	41.37	46.40	50.44

South Declination.

Deg.	0 d	2 d	5 d	7 d	10 d	12 d	15 d	17 d	20 d	22 d	23 d
Min.		30m		30m		30m		30m			30m
Point.	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South	12	12	12	12	12	12	12	12	12	12	12
s by w	0.39	0.40	0.41	0.42	0.43	0.44	0.45	0.46	0.47	0.48	0.49
s s w	1.18	1.20	1.22	1.24	1.26	1.28	1.31	1.33	1.35	1.37	1.38
sw by s	1.59	2.02	2.05	2.08	2.11	2.14	2.18	2.21	2.24	2.27	2.29
s w	2.42	2.46	2.50	2.54	2.58	3.02	3.06	3.11	3.15		
s w b w	3.28	3.33	3.38	3.43	3.47	3.52	3.57				
w s w	4.17	4.22	4.28	4.33	4.39						
w by s	5.08	5.14	5.19								
West.	6.00										
☉ fet.	6.00	5.44	5.27	5.10	4.52	4.33	4.14	5.53	3.31	3.11	2.55

*A Sun-Dial for the Latitude of 60 Degrees.*

## North Declination.

Deg.	0	d 2	d 5	d 7	d 10	d 12	d 15	d 17	d 20	d 22	d 23	
Min.		30m		30m		30m		30m			30m	
Point.	h	m	h	m	h	m	h	m	h	m	h	m
South	12	12	12	12	12	12	12	12	12	12	12	
s by w	0.39	0.38	0.37	0.36	0.35	0.34	0.33	0.32	0.31	0.30	0.29	
s s w	1.19	1.17	1.15	1.13	1.11	1.09	1.07	1.05	1.03	1.01	1.00	
s w by s	2.00	1.57	1.54	1.51	1.48	1.45	1.42	1.39	1.36	1.33	1.31	
s w	2.44	2.40	2.36	2.33	2.28	2.24	2.20	2.16	2.12	2.08	2.06	
sw by w	3.29	3.25	3.20	3.16	3.11	3.06	3.01	2.56	2.51	2.47	2.44	
w s w	4.18	4.13	4.07	4.02	3.57	3.51	3.46	3.40	3.34	3.29	3.25	
w by s	5.08	5.03	4.57	4.51	4.45	4.40	4.34	4.27	4.21	4.16	4.12	
West.	6.00	5.54	5.48	5.42	5.36	5.31	5.24	5.18	5.11	5.06	5.02	
w by n				6.35	6.29	6.23	6.17	6.11	6.04	5.59	5.55	
wn w						7.16	7.10	7.04	6.59	6.54	6.50	
nw by w								7.57	7.52	7.48	7.45	
n w										8.41	8.39	
☉ set.	6.00	6.17	6.35	6.53	7.11	7.30	7.51	8.13	8.36	8.58	9.15	
Sun's	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	
Amp.	0.00	5.00	10.2	15.5	20.19	25.39	31.10	36.58	43.10	48.32	52.53	

## South Declination.

Deg.	0	d 2	d 5	d 7	d 10	d 12	d 15	d 17	d 20	d 22	d 23	
Min.		30m		30m		30m		30m			30m	
Point.	h	m	h	m	h	m	h	m	h	m	h	m
South	12	12	12	12	12	12	12	12	12	12	12	
s by w	0.39	0.40	0.41	0.42	0.43	0.44	0.45	0.46	0.47	0.48	0.49	
ss w	1.19	1.21	1.23	1.25	1.27	1.29	1.31	1.33	1.35	1.37	1.38	
sw by s	2.00	2.03	2.06	2.09	2.12	2.15	2.18	2.21	2.24	2.27	2.29	
s w	2.44	2.47	2.51	2.55	2.59	3.03	3.07	3.11	3.15			
sw by w	3.29	3.34	3.39	3.43	3.48	3.53	3.58					
ws w	4.18	4.23	4.28	4.33	4.39							
w by s	5.08	5.14	5.20									
West	6.00											
☉ set.	6.00	5.43	5.25	5.07	4.49	4.30	4.09	3.47	3.24	3.03	2.45	

*The Description and Use of the foregoing Tables.*

**T**Hese Tables are titled at the Head of each Page thus: A Sun-Dial for the Latitude of 00 Degrees; the next is, A Sun-Dial for the Latitude of 1 Degree; and so on orderly unto 60 Degrees, making in all 61 Dials; from Page (24.) to Page (84.)

Each Dial hath two Tables, (the uppermost for North-Declination, the lowermost for South Declination) and twelve Columns in each Table: At the head of each Column, and right against Deg. Min. you have the degrees of Declination, thus 0d | 2d 30m | 5d | 7d 30m | 10d | 12d 30m | 15d | 17d 30m | 20d | 22d | 23d 30m |: d standing for degree, and m for minute.

Under those degrees and minutes of Declination in each Column is set, | h m |: h stands for hour, and m for minute of an hour.

In the left hand Column of each Table, under Point, (at the head) is the Points of the Compass, thus; South; S. by W. S. S. W. S. W. by S. S. W. &c. S. by W. standing for South and by West; S. S. W. for South South West; S. W. by S. for South West by South, and so for the rest.

In this Impression is added at the foot of each Table, the Sun's-setting and Amplitude, agreeable to those several Declinations at the head of each Column and are distinguished from the rest by the words in the left-hand Column thus; Sun sets; Sun's Amplitude; or so much of them as the Column can contain. Note; the Sun's-setting is annexed to each Table; but the Amplitude only to that for N. Declination, because it is the same (for quantity) for South.

The Setting is hours and minutes but the Amplitude is degrees and minutes, having (d) over the degrees, and (m) over the min.

By these Tables (being Sun-Dials for all Latitudes) you may know the time of the Day, the Sun being visible in any part of your Hemisphere, as true and exact as tho' he were upon your Meridian; also his Rising, Setting and Amplitude. The like may be known by any Star, whose Declination doth not exceed 23d. 30m. as will be evident by the following Proposition.

*Proposition 1.*

**T**HE Latitude of the Place, the Declination, and Bearing of the Sun given; to find the Hour of the Day.

*Note*; By Bearing, is meant the Azimuth, or Point of the Compass he is upon; and that is found by setting the *Sun* with an Azimuth Compass, which is the truest way.

*The Resolution of this Proposition is thus:*

1. Seek the *Sun-Dial* for the given Latitude.
2. At the Head of the Table seek the given Declination, or the nearest to it.
3. Find the given Bearing, among the Points of the Compass in the left-hand Column.
4. Then look straight to the right-hand of the Bearing, till you come right under the Declination, (before found in the head of the Table; ) and what Number you find there, is the hour required.

*Example 1.* In the Latitude of 30 d. the Sun having 15 d. N. Declination; I desire to know at what a Clock the Sun cometh upon the S. W. Point of the Compass.

Look for the Table that belongeth to the Latitude of 30 d. in the Head of the Table, and for 15 d. in the Column of N. Declination, and for South West on the left-hand of the Table, and in the common Angle of meeting you will find the hour of the day to be 00 h. 58 m. that is 58 minutes past 12 a Clock; the time required.

*Example 2.* I desire to know at what a Clock the Sun cometh to the S. W. in the Latitude of 30 d. the Sun having 15 d. 00 m. S. Declination. *Answer*, 34 m. past 2 a Clock.

For if you turn to the *Dial* for Latitude 30 d. and in the Table for South Declination, seek 15 d. at the head of it, under which, and against S. W. (on the left hand) you will find 2 h. 34 m. the time of the day required.

If the Declination be not the same with the Declination in the head of the Table, then look under that Declination nearest to the Declination proposed.

But more exactly thus; Find the hour for the next Declination both lesser, and greater than the Declination proposed, and the difference of those Hours, as also of the Declinations belonging to them: then say,

As



As the last difference is to the first difference, so is the difference between the Declination proposed, and the next lesser in the Table to a fourth proportional, which add to (when the hour in the Table increaseth) or (when it decreaseth) subtract from the hour belonging to the lesser Declination aforesaid: So you'll have the hour required exact to the Declination proposed.

*Example 3.* Admit the Declination to be 18 d. 20 m. N. I desire to know at what a Clock the Sun cometh upon the W. S. W. Point of the Compass, in the Latitude of 30 d.

In the Table, the nearest number to 18 d. 20 m, is 17 d. 30 m. Then under 17 d. 30 m. and against W. S. W. is 1 h. 42 m. which sheweth that the Sun cometh upon the W. S. W. Point of the Compass, at 42 m. past 1 a Clock.

Now because the Declination proposed, and the Declination in the head of the Table, are somewhat differing; therefore you may make a Proportion, very easily thus: under 17 d. 30 m. and against W. S. W. you find 1 h. 42 m. and under 20 d. 00 m. you find 1 deg. 25 min. the difference between these two Numbers is 17 m. And the difference between the Declination 17 d. 30 m. and 20 deg. is 2 d. 30 m. or 150 m. Also the difference between the Declinations 18 d. 20 m. and 17 d. 30 m. is 50 m. Then say, as 150 m. is to 17 m. so is 50 m. to 6 m. almost: But because 50 is  $\frac{2}{3}$  of 150, therefore the  $\frac{2}{3}$  d part of 17 m. is near 6 min. which subtracted from 1 h. 42 m. (because the hour decreaseth) and the Remainder 1 h. 36 m. is the true hour of the day, the Sun being upon the W. S. W. point of the Compass, having 18 d. 20 m. North Declination.

Do the like with any other deg. and min. of Declination. But if the Declination be not much differing from that in the Head of the Table, you need not make any Proportion: Likewise, if the Sun be near the Meridian, you need not make any Proportion, because there the difference is but small.

*Note;* There is none but the Afternoon Points in the Tables of these Dials, yet you may easily find the time of the day for the Forenoon Points by what follows.

A Table of Points of the Compass equally distant from the Meridian.	
Forenoon Points.	Afternoon Points.
South.	
S. by E.	S. by W.
S. S. E.	S. S. W.
S. E. by S.	S. W. by S.
S. E.	S. W.
S. E. by E.	S. W. by W.
E. S. E.	W. S. W.
E. by S.	W. by S.
East.	West.
E. by N.	W. by N.
E. N. E.	W. N. W.
N. E. by E.	N. W. by W.
N. E.	N. W.
N. E. by N.	N. W. by N.
N. N. E.	N. N. W.
N. by E.	N. by W.
North.	
Forenoon Points.	Afternoon Points.

For points equally distant from the Meridian, are equal Time from Noon; so that at what space of Time from Noon the Sun is S. E. in the Forenoon, the like space of Time from Noon he is S. W. after Noon.

In this last Table the points that stand right against one another, are equally distant from the Meridian; therefore to find the Hour of the Day the Sun being upon any of *Forenoon Points* see what time of the Day it is when the Sun is upon the *Afternoon-points*, that stand right against the *Forenoon Point* desired, and subtract those hours and minutes from 12 hours, the Remainder is the hour and minute of the Day required.

Ex. 4. In the Lat. of 60 deg. the Sun being N. E. I demand the hour of the day the Sun having 22 deg. North Declination? In the Sun-Dial for Latitude of 60 degrees, look against N. W. which is the *Afternoon Point* correspond to N. E.

+

the

the *Forenoon Point*, and finding the Declination 22 deg. in the head of the Table, in the common Angle of meeting is 8 hours 41 min. which subtract from 12 hours, the Remainder 5 hours 19 m. is the hour of the Day desired in the Morning.

*Ex. 5.* The Sun being E.N.E. in the same Latitude with the same Declination, I demand the Hour of the Day?

In Latitude 60 deg. and North-Declination 22 d. the Sun being W.N.W. it is 54 m. past 6 a Clock in the Afternoon; which subtract from 12 hours, the Remainder is 6 minutes past 5 in the Morning; the time desired.

*Ex. 6.* In the Latitude of 35 d. the Sun having 15 d. North Declination, the Sun being S. E. by E. I demand the hour and minute of the Day?

In the Table for Latitude 35 d. look against S.W. by W. the *Afternoon Point* correspondent to S. E. by E. the *Forenoon Point*. And the Declination 15 d. in the head of the Table, in the common Angle of meeting is 1 h. 45 m. which deducted from 12 hours, the Remainder 15 m. past 10 a Clock, the true time of day desired.

*Examp. 7.* In the Latitude of 35 d. North, the Sun having 15 d. South Declination, and being S. E. by E. I demand the hour of the day?

*Answer,* 20 m. past 8 a Clock; for the hour in the Table is 3 h. 40 m. which subtracted from 12 h. leaveth 8 h. 20 m. the Hour required.

The like is to be understood in any other Latitude, with any other Declination, and with any other Point.

*Note;* These Tables serve as well in South Latitude as in North, only the difference will be thus:

If the Latitude be contrary, then the Declination must be contrary, and the Points of the Compass contrary; that is to say, North Declination must be South, and South Declination must be North; and S. by W. must be N. by W. and S. S. W. must be N. N. W. and S. W. by S. must be N. W. by N. and so for any other Point, as in this following Table.

*The Mariners Compass Rectified.*

A Table of Pointsequally distant from Noon, both in North and South Latitude; either before or after Noon.

North Latitude.		South Latitude.	
Forenoon.	Afternoon.	Forenoon.	Afternoon.
<i>South.</i>	<i>South.</i>	<i>North.</i>	<i>North.</i>
S. by E.	S. by W.	N. by E.	N. by W.
S. S. E.	S. S. W.	N. N. E.	N. N. W.
S. E. by S.	S. W. by S.	N. E. by N.	N. W. by N.
South East.	South West.	North East	North West.
S. E. by E.	S. W. by W.	N. E. by E.	N. W. by W.
E. S. E.	W. S. W.	E. N. E.	W. N. W.
E. by S.	W. by S.	E. by N.	W. by N.
<i>East</i>	<i>West</i>	<i>East</i>	<i>West</i>
E. by N.	W. by N.	E. by S.	W. by S.
E. N. E.	W. N. W.	E. S. E.	W. S. W.
N. E. by E.	N. W. by W.	S. E. by E.	S. W. by W.
N. E.	North West.	South East	S. W.
N. E. by N.	N. W. by N.	S. E. by S.	S. W. by S.
N. N. E.	N. N. W.	S. S. E.	S. S. W.
N. by E.	N. by W.	S. by E.	S. by W.
<i>North</i>	<i>North</i>	<i>South.</i>	<i>South.</i>

To find the Hour of the Night by the Stars and the Table of the Sun Dial.

**B**Y these Tables you may find the Hour of the Night, by the bearing of any known Star, whose Declination doth not exceed the Sun's greatest Declination; after this manner.

Find the time of the Star's coming to the Meridian on the day proposed; then if the Star be on the East side of the Meridian, subtract those hours and minutes which these Tables shew, from the time of the Star's coming to the Meridian, the Remainder is the hour of the Night. But if the Star be on the West-side of the Meridian then add those hours and minutes abovesaid to the time of the Star's coming to the Meridian, the Sum is the hour of the Night.

To find a Star's coming on or to the Meridian, see the

See.



## The Mariners Compass Rectified.

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*Sea-mans Kalendar*, in the Uses of the Tables of the Sun's and Stars Right Ascension, page 91, 92, 93, &c.

*Example 8.* Admit the 6th day of *October*, in the Latitude 40 deg. 00 min. North, I observe the *Bull's Eye* to be S. E. I demand the hour of the Night?

The 6th day of *October*, the *Bull's Eye* cometh on the Meridian at 45 minutes past two a Clock in the Morning; this Star's Declination is 15 deg. 48 min. North; therefore in the Table that belongs to 40 deg. seek in the Head of the Table the Declination, by the side, the Point of the Compass, and in the common Angle of meeting is 1 hour 31 min. which subtract from 2 hours 45 min. the Star's Southing, the Remainder 1 h. 14 m. is the hour of the Night desired. But if this Star had born S. W. you must have added, and then the hour would have been 16 minutes past 4 a Clock in the Morning.

### The Operation.

	h. m.
The time of the Star's being on the Meridian	2, 45 m.
His distance from the Merid. either at S. E. or S. W.	1, 31
The time of the Night, the Star being S. E.	<u>1, 14 m.</u>
The time of the Night the Star being S. W.	4, 16 m.

*Example 9.* Admit the 5th day of *November*, in Latitude 45 d. 00 m. North, and I see the *Lyon's Tail* upon the E. S. E. Point of the Compass, having Declination 16 d. 25 m. N. I demand the hour of the Night?

	h. m.
The time of this Star's being on the Meridian	08, 09 m.
His distance from the Meridian	<u>03, 00 m.</u>
Time of the Night the Star is E. S. E.	05, 09 m.
Time of the Night the Star is W. S. W.	11, 09 m.

*Note;* If the Compass hath Variation, you must allow for the Variation: But if you will use this following Instrument I call a Rectifier, you need not reckon which way the Variation is, either Eastward or Westward; for this Instrument will do it so plain, that you cannot be mistaken, as is shewn in the following part of this Book: But for the present I will only give you one Proposition, and apply it upon the Rectifier, which is as followeth.

Ad-

Admit in Latitude 47 deg. 00 min. North, the Sun being in one of the Equinoctial Points, (at which time he hath no Declination) I observe the Sun to rise upon the E. S. E. Point of the Compass; I demand the Variation?

The Sun hath no Declination in any Latitude; if there be no variation, the Sun will rise at East, and set at West; but according to the foregoing Proposition, the Sun did rise at E. S. E. therefore there is two Points Variation.

*The Description of the Rectifier.*

**T**HIS Instrument containeth two Circles or Compasses one within the other; but as it is made in Wood, the one moveth upon the other; so that the inward or upper Circle, representeth the Compass that you steer by, which is subject to Variation; but the outward or under Circle, representeth a true Compass that never varieth. And by it you may readily rectify your Compass, when it doth vary; thus:

Always bring the true Point of Rising or Setting on the outward or under Compass, to touch the false Point of Rising or Setting on the inward or upper Compass, there let the Instrument stand.

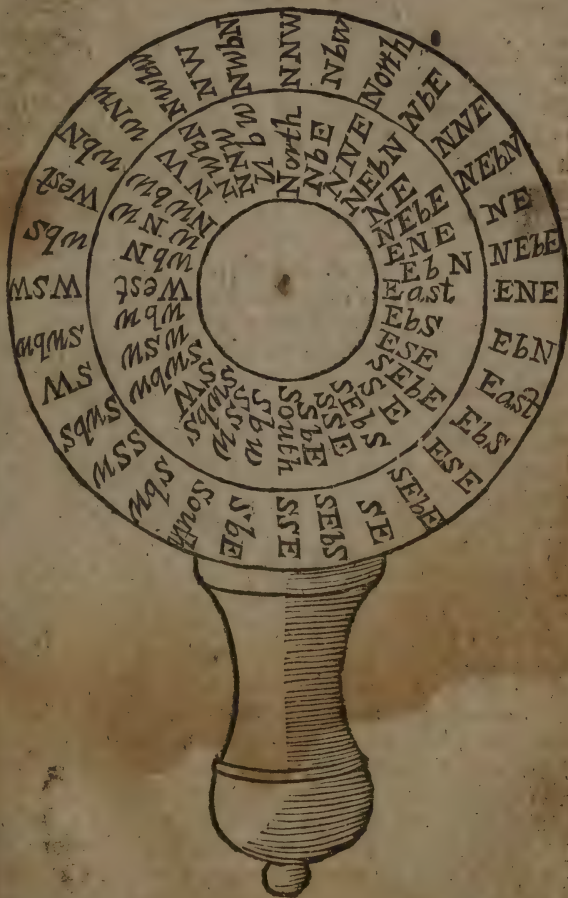
As in this foregoing Proposition: The East-Point is the true point of rising, and the E. S. E. Point is the false Point of rising; therefore bring the East-point on the outward or under Compass to touch the E. S. E. Point on the inward or upper Compass.

Thus the points that are upon the outward Compass, do explain the Points that are upon the inward Compass: So that according to this Observation the N. N. E. Point on your Compass, is the true North Point; and the N. is the true N. N. W. and the N. W. is true W. N. W. and the West is the true W. S. W. Point; as plainly appears by the Rectifier

*Note;* The true Points are always on the outward Circle or Compass.

This Instrument in Wood, is larger than this Figure, and there the Points be divided into Halves and Quarters; as also each Compass (in some) is divided into 360 deg. numbred from the North, and South, both ways toward the East and West, ending in 90 degrees.

A RECTIFIER.



To find the Sun's Rising, Setting, or Amplitude by the Tables of Sun Dials.

**I**N the Table for the Latitude of the Place, seek the Declination, under which, and against ☉ *Sets*, is his Setting; and against *Sun's Amp.* is the Amplitude.

And if you subtract the *Sun's* Setting from 12 hours, it gives his Rising.

*Example 1.* Latitude 50 d. North, Sun's Declination 23 d. North: I demand his rising, Setting, and his Amplitude.

In the Table for 50 d. seek the Declination 20 d. North at the Head of the Table, under which, and right against ☉ *set* is 7.43, which sheweth the Sun setteth at 43 min. after 7 in the Afternoon; which subtract from 12 h. the remainder 4 h. 17 m. is his Rising.

In like manner under the Sun's Declination 20 d. and against *Sun's Amp.* is 32 d. 9 m. the Sun's Amplitude; that is East Northerly at his Rising; but West Northerly at Setting.

*Note, 1.* The Amplitude is always of the same name with the Declination.

For that reason the Amplitude is set only for North Declination, being the same in *Quantity* for South Declination, only in *Quality* it's the contrary.

*Note, 2.* The Sun's Rising for North Declination, is the Setting for South Declination.

For that reason the Table having only ☉ *Sets*, both for North, and South Declination; yet they serve for both Rising and Setting, by looking contrary to the given Declination.

Wherefore to find the *Sun's* Rising, when he hath North Declination, look under South Declination; and when he hath South Declination, (to find his Rising) look under North Declination.

*Note,*



*Note, 3.* In South Latitude with South Declination, also in South Latitude with North Declination; the Sun's Rising and Setting is the same as in North Latitude with North Declination, as also in North Latitude with South Declination.

Therefore these Tables are as useful in South Latitude, as in North Latitude, if North Declination, in these Tables be counted for South, and South for North.

*Note, 4.* The Rising, Setting and Amplitude of any Star whose Declination doth not exceed the Sun's greatest Declination may be found by these Tables; provided its Southing or time of the Star's coming to or on the Meridian be known.

For the time of *Sun setting* in these Tables for any Latitude, is a Star's half Continuance above the Horizon, having equal Declination and of the same kind with the Sun, for the same Latitude.

Therefore the half Continuance of a Star above the Horizon, (found in these Tables as before directed) added to, and subtracted from the Star's coming to or on the Meridian; the first is the Star's setting, the latter its rising.

Examples of this Nature you will find in the Use of the next Tables of Semidiurnal and Seminocturnal Arches, to which the Reader is referr'd.

The Amplitude of a Star by the foregoing Tables, is found as the Amplitude of the Sun, which is more fully treated on in the Use of the Tables of Amplitude.

*Astronomical TABLES of Semidiurnal and Seminocturnal Arches, Shewing the true Time of the SUN's Rising and Setting, with the Length of the Day and Night, for any Day of the Year; siting all Places in the World, whose Pole is not elevated above 60 Degrees; either North or South; and to last with Exactness, as long as God upholdeth the Course of Nature.*

*A Table shewing the Semidiurnal-Arch, or the Time of Sun-setting, when the Sun hath North Declination; and the Seminocturnal-Arch, or the Time of Sun-rising, when the Sun hath South Declination.*

The Degrees of Latitude.

Sun's Decl.	1		2		3		4		5		6	
	H. M.		H. M.		H. M.		H. M.		H. M.		H. M.	
0	6	00	6	00	6	00	6	00	6	00	6	00
1	6	00	6	00	6	00	6	00	6	00	6	00
2	6	00	6	00	6	00	6	00	6	01	6	01
3	6	00	6	00	6	01	6	01	6	01	6	01
4	6	00	6	00	6	01	6	01	6	01	6	02
5	6	00	6	00	6	01	6	01	6	02	6	02
6	6	00	6	01	6	01	6	02	6	02	6	03
7	6	00	6	01	6	01	6	02	6	02	6	03
8	6	00	6	01	6	02	6	02	6	03	6	03
9	6	01	6	01	6	02	6	03	6	03	6	04
10	6	01	6	01	6	02	6	03	6	04	6	04
11	6	01	6	01	6	02	6	03	6	04	6	05
12	6	01	6	02	6	02	6	03	6	04	6	05
13	6	01	6	02	6	03	6	04	6	05	6	06
14	6	01	6	02	6	03	6	04	6	05	6	06
15	6	01	6	02	6	03	6	04	6	05	6	06
16	6	01	6	02	6	03	6	05	6	06	6	07
17	6	01	6	02	6	04	6	05	6	06	6	07
18	6	01	6	03	6	04	6	05	6	07	6	08
19	6	01	6	03	6	04	6	05	6	07	6	08
20	6	01	6	03	6	04	6	06	6	07	6	09
21	6	02	6	03	6	05	6	06	6	08	6	09
22	6	02	6	03	6	05	6	06	6	08	6	10
23	6	02	6	03	6	05	6	07	6	09	6	10
23, 31	6	02	6	04	6	05	6	07	6	09	6	11

A Table shewing the Semidiurnal-Arch or the Time of Sun-setting, when the Sun hath North Declination; and the Seminocturnal-Arch, or Time of Sun-rising when the Sun hath South Declination.

The Degrees of Latitude.

Sun's Decl.	7	8	9	10	11	12
	H. M.	H. M.	H. M.	H. M.	H. M.	H. M.
0	6 00	6 00	6 00	6 00	6 00	6 00
1	6 00	6 00	6 01	6 01	6 01	6 01
2	6 01	6 01	6 01	6 01	6 02	6 02
3	6 01	6 02	6 02	6 02	6 02	6 03
4	6 02	6 02	6 02	6 03	6 03	6 03
5	6 02	6 03	6 03	6 04	6 04	6 04
6	6 03	6 03	6 04	6 04	6 05	6 05
7	6 03	6 04	6 04	6 05	6 05	6 06
8	6 04	6 04	6 05	6 06	6 06	6 07
9	6 04	6 05	6 06	6 06	6 07	6 08
10	6 05	6 06	6 06	6 07	6 08	6 09
11	6 05	6 06	6 07	6 08	6 09	6 09
12	6 06	6 07	6 08	6 09	6 09	6 10
13	6 06	6 07	6 08	6 09	6 10	6 11
14	6 07	6 08	6 09	6 10	6 11	6 12
15	6 08	6 09	6 10	6 11	6 12	6 13
16	6 08	6 09	6 10	6 12	6 13	6 14
17	6 09	6 10	6 11	6 12	6 14	6 15
18	6 09	6 10	6 12	6 13	6 14	6 16
19	6 10	6 11	6 13	6 14	6 15	6 17
20	6 10	6 12	6 14	6 15	6 16	6 18
21	6 11	6 12	6 14	6 16	6 17	6 19
22	6 11	6 13	6 15	6 16	6 18	6 20
23	6 12	6 14	6 15	6 17	6 19	6 21
23, 31	5 12	6 14	6 16	6 18	6 19	6 22

*A Table shewing the Semidiurnal-Arch or the Time of Sun-setting, when the Sun hath North Declination; and the Seminocturnal-Arch, or Time of Sun-rising when the Sun hath South Declination.*

The Degrees of Latitude.

Decl.	Sun's	13	14	15	16	17	18
		H. M.	H. M.	H. M.	H. M.	H. M.	H. M.
0		6 00	6 00	6 00	6 00	6 00	6 00
1		6 01	6 01	6 01	6 01	6 01	6 01
2		6 02	6 02	6 02	6 02	6 02	6 02
3		6 03	6 03	6 03	6 03	6 04	6 04
4		6 04	6 04	6 04	6 05	6 05	6 05
5		6 05	6 05	6 05	6 06	6 06	6 06
6		6 06	6 06	6 06	6 07	6 07	6 08
7		6 06	6 07	6 07	6 08	6 09	6 09
8		6 07	6 08	6 09	6 09	6 10	6 10
9		6 08	6 09	6 10	6 10	6 11	6 12
10		6 09	6 10	6 11	6 12	6 12	6 13
11		6 10	6 11	6 12	6 13	6 13	6 14
12		6 11	6 12	6 13	6 14	6 15	6 16
13		6 12	6 13	6 14	6 15	6 16	6 17
14		6 13	6 14	6 15	6 16	6 17	6 19
15		6 14	6 15	6 16	6 18	6 19	6 20
16		6 15	6 16	6 18	6 19	6 20	6 21
17		6 16	6 17	6 19	6 20	6 21	6 23
18		6 17	6 19	6 20	6 21	6 23	6 24
19		6 18	6 20	6 21	6 23	6 24	6 26
20		6 19	6 21	6 22	6 24	6 25	6 27
21		6 20	6 22	6 24	6 25	6 27	6 29
22		6 21	6 23	6 25	6 27	6 28	6 30
23		6 22	6 24	6 26	6 28	6 30	6 32
23, 31		5 23	6 25	6 17	6 29	6 31	6 33



A Table shewing the Semidiurnal-Arch, or the Time of Sun-setting, when the Sun hath North Declination; and the Seminocturnal-Arch, or the Time of Sun-rising, when the Sun hath South Declination.

The Degrees of Latitude.

Sun's Decl.	19	20	21	22	23	24
	H. M.	H. M.	H. M.	H. M.	H. M.	H. M.
0	6 00	6 00	6 00	6 00	6 00	6 00
1	6 01	6 01	6 01	6 02	6 02	6 02
2	6 03	6 03	6 03	6 03	6 03	6 03
3	6 04	6 04	6 05	6 05	6 05	6 05
4	6 05	6 09	6 06	6 06	6 07	6 07
5	6 07	6 07	6 08	6 08	6 09	6 09
6	6 08	6 09	6 09	6 10	6 10	6 11
7	6 10	6 10	6 11	6 11	6 12	6 13
8	6 11	6 12	6 12	6 13	6 14	6 14
9	6 13	6 13	6 14	6 15	6 15	6 16
10	6 14	6 15	6 16	6 16	6 17	6 18
11	6 15	6 16	6 17	6 18	6 19	6 20
12	6 17	6 18	6 19	6 20	6 21	6 22
13	6 18	6 19	6 20	6 21	6 23	6 24
14	6 20	6 21	6 22	6 23	6 24	6 25
15	6 21	6 22	6 24	6 25	6 26	6 27
16	6 23	6 24	6 25	6 27	6 28	6 29
17	6 24	6 25	6 27	6 28	6 30	6 31
18	6 26	6 27	6 29	6 30	6 32	6 33
19	6 27	6 29	6 30	6 32	6 34	6 35
20	6 28	6 30	6 32	6 34	6 36	6 37
21	6 30	6 32	6 34	6 36	6 37	6 39
22	6 31	6 33	6 35	6 37	6 39	6 41
23	6 33	6 35	6 37	6 39	6 41	6 43
23, 31	6 34	6 36	6 38	6 40	6 43	6 45

*A Table shewing the Semidiurnal-Arch, or the Time of Sun-setting, when the Sun hath North Declination; and the Seminocturnal-Arch, or the Time of Sun-rising, when the Sun hath South Declination.*

The Degrees of Latitude.

Decl.	Suns	25	26	27	28	29	30
		H. M.	H. M.	H. M.	H. M.	H. M.	H. M.
0		6 00	6 00	6 00	6 00	6 00	6 00
1		6 02	6 02	6 02	6 02	6 02	6 02
2		6 04	6 04	6 04	6 04	6 04	6 05
3		6 06	6 06	6 06	6 06	6 07	6 07
4		6 07	6 08	6 08	6 09	6 09	6 09
5		6 09	6 10	6 10	6 11	6 11	6 12
6		6 11	6 12	6 12	6 13	6 13	6 14
7		6 13	6 14	6 14	6 15	6 16	6 16
8		6 15	6 16	6 16	6 17	6 18	6 19
9		6 17	6 18	6 19	6 19	6 20	6 21
10		6 19	6 20	6 21	6 22	6 23	6 23
11		6 21	6 22	6 23	6 24	6 25	6 26
12		6 23	6 24	6 25	6 26	6 27	6 28
13		6 25	6 26	6 27	6 28	6 29	6 31
14		6 27	6 28	6 29	6 30	6 32	6 33
15		6 29	6 30	6 31	6 33	6 34	6 36
16		6 31	6 32	6 34	6 35	6 37	6 38
17		6 33	6 34	6 36	6 37	6 39	6 41
18		6 35	6 36	6 38	6 40	6 42	6 43
19		6 37	6 39	6 40	6 42	6 44	6 46
20		6 39	6 41	6 43	6 45	6 47	6 48
21		6 41	6 43	6 45	6 47	6 49	6 51
22		6 43	6 45	6 48	6 50	6 52	6 54
23		6 46	6 48	6 50	6 52	6 54	6 57
23, 31		6 47	6 49	6 51	6 53	6 56	6 59

Degrees of Declination

A Table shewing the Semidiurnal-Arch, or the Time of Sun-setting, when the Sun hath North Declination; and the Seminocturnal-Arch, or the Time of Sun-rising, when the Sun hath South Declination.

The Degrees of Latitude.

Sun's Decl.	31	32	33	34	35	36
	H. M.	H. M.	H. M.	H. M.	H. M.	H. M.
0	6 00	6 00	6 00	6 00	6 00	6 00
1	6 02	6 02	6 03	6 03	6 03	6 03
2	6 05	6 05	6 05	6 05	6 06	6 06
3	6 07	6 08	6 08	6 08	6 08	6 09
4	6 10	6 10	6 10	6 11	6 11	6 12
5	6 12	6 13	6 13	6 14	6 14	6 15
6	6 15	6 15	6 16	6 16	6 17	6 18
7	6 17	6 18	6 18	6 19	6 20	6 20
8	6 19	6 20	6 21	6 22	6 23	6 23
9	6 22	6 23	6 24	6 25	6 25	6 26
10	6 24	6 25	6 26	6 27	6 28	6 29
11	6 27	6 28	6 29	6 30	6 31	6 32
12	6 29	6 31	6 32	6 33	6 34	6 35
13	6 32	6 33	6 34	6 36	6 37	6 39
14	6 34	6 36	6 37	6 39	6 40	6 42
15	6 37	6 39	6 40	6 42	6 43	6 45
16	6 40	6 41	6 43	6 45	6 46	6 48
17	6 42	6 44	6 46	6 48	6 49	6 51
18	6 45	6 47	6 49	6 51	6 53	6 55
19	6 48	6 50	6 52	6 54	6 56	6 58
20	6 51	6 53	6 55	6 57	6 59	7 01
21	6 53	6 56	6 58	7 00	7 02	7 05
22	6 56	6 58	7 01	7 03	7 06	7 08
23	6 59	7 01	7 04	7 06	7 09	7 12
23,31	7 01	7 03	7 06	7 08	7 11	7 14

*A Table shewing the Semidiurnal-Arch, or the Time of Sun-setting, when the Sun hath North Declination; and the Seminocturnal-Arch, or the Time of Sun-rising, when the Sun hath South Declination.*

The Degrees of Latitude.

Decl.	Sun's	37	38	39	40	41	42
		H. M.	H. M.	H. M.	H. M.	H. M.	H. M.
0		6 00	6 00	6 00	6 00	6 00	6 00
1		6 03	6 03	6 03	6 03	6 03	6 04
2		6 06	6 06	6 06	6 07	6 07	6 07
3		6 09	6 09	6 10	6 10	6 10	6 11
4		6 12	6 13	6 13	6 13	6 14	6 14
5		6 15	6 16	6 16	6 17	6 17	6 18
6		6 18	6 19	6 20	6 20	6 21	6 22
7		6 21	6 22	6 23	6 24	6 25	6 25
8		6 24	6 25	6 26	6 27	6 28	6 29
9		6 27	6 28	6 29	6 31	6 32	6 33
10		6 31	6 32	6 33	6 34	6 35	6 37
11		6 34	6 35	6 36	6 38	6 39	6 40
12		6 37	6 38	6 40	6 41	6 43	6 44
13		6 40	6 42	6 43	6 45	6 46	6 48
14		6 43	6 45	6 47	6 48	6 50	6 52
15		6 47	6 48	6 50	6 52	6 54	6 56
16		6 50	6 52	6 54	6 56	6 58	7 00
17		6 53	6 55	6 57	7 00	7 02	7 04
18		6 57	6 59	7 01	7 03	7 06	7 08
19		7 00	7 02	7 05	7 07	7 10	7 12
20		7 04	7 06	7 09	7 11	7 14	7 17
21		7 07	7 10	7 12	7 15	7 18	7 21
22		7 11	7 14	7 16	7 19	7 22	7 25
23		7 15	7 17	7 20	7 23	7 27	7 30
23, 31		7 17	7 19	7 22	7 26	7 29	7 32

Degrees of Declination.



A Table shewing the Semidiurnal-Arch, or the Time of Sun-setting, when the Sun hath North Declination; And the Seminocturnal-Arch, or the Time of Sun-rising, when the Sun hath South Declination.

The Degrees of Latitude.

Sun's Decl.	43	44	45	46	47	48
	H. M.	H. M.	H. M.	H. M.	H. M.	H. M.
0	6 00	6 00	6 00	6 00	6 00	6 00
1	6 04	6 04	6 04	6 04	6 04	6 04
2	6 07	6 08	6 08	6 08	6 09	6 09
3	6 11	6 12	6 12	6 12	6 13	6 13
4	6 15	6 15	6 16	6 17	6 17	6 18
5	6 19	6 19	6 20	6 21	6 22	6 22
6	6 22	6 23	6 24	6 25	6 26	6 27
7	6 26	6 27	6 28	6 29	6 30	6 31
8	6 30	6 31	6 32	6 33	6 35	6 36
9	6 34	6 35	6 36	6 38	6 39	6 41
10	6 38	6 39	6 41	6 42	6 44	6 45
11	6 42	6 43	6 45	6 46	6 48	6 50
12	6 46	6 47	6 49	6 51	6 53	6 55
13	6 50	6 52	6 53	6 55	6 57	6 59
14	6 54	6 56	6 58	7 00	7 02	7 04
15	6 58	7 00	7 02	7 04	7 07	7 09
16	7 02	7 04	7 07	7 09	7 12	7 14
17	7 06	7 09	7 11	7 14	7 17	7 19
18	7 11	7 13	7 16	7 19	7 22	7 25
19	7 15	7 18	7 21	7 24	7 27	7 30
20	7 19	7 22	7 25	7 29	7 32	7 35
21	7 24	7 27	7 30	7 34	7 37	7 41
22	7 28	7 32	7 35	7 39	7 43	7 47
23	7 33	7 37	7 40	7 44	7 48	7 53
23, 31	7 36	7 40	7 43	7 47	7 51	7 56

*A Table shewing the Semidiurnal-Arch, or the Time of Sun-setting, when the Sun hath North Declination; And the Seminocturnal-Arch, or the Time of Sun-rising, when the Sun hath South Declination.*

The Degrees of Latitude.

Sun's Decl.	49		50		51		52		53		54	
	H.	M.	H.	M.	H.	M.	H.	M.	H.	M.	H.	M.
0	6	00	6	00	6	00	6	00	6	00	6	00
1	6	05	6	05	6	05	6	05	6	05	6	06
2	6	09	6	10	6	10	6	10	6	11	6	11
3	6	14	6	14	6	15	6	15	6	16	6	17
4	6	18	6	19	6	20	6	21	6	21	6	22
5	6	23	6	24	6	25	6	26	6	27	6	28
6	6	28	6	29	6	30	6	31	6	32	6	33
7	6	32	6	34	6	35	6	36	6	38	6	39
8	6	37	6	39	6	40	6	41	6	43	6	45
9	6	42	6	44	6	45	6	47	6	49	6	50
10	6	47	6	49	6	50	6	52	6	54	6	56
11	6	52	6	54	6	56	6	58	7	00	7	02
12	6	57	6	59	7	01	7	03	7	06	7	08
13	7	02	7	04	7	06	7	09	7	11	7	14
14	7	07	7	09	7	12	7	14	7	17	7	20
15	7	12	7	14	7	17	7	20	7	23	7	27
16	7	17	7	20	7	23	7	26	7	29	7	33
17	7	22	7	25	7	29	7	32	7	36	7	40
18	7	28	7	31	7	35	7	38	7	42	7	46
19	7	33	7	37	7	41	7	45	7	49	7	53
20	7	39	7	43	7	47	7	51	7	56	8	00
21	7	45	7	49	7	53	7	58	8	02	8	08
22	7	51	7	55	8	00	8	05	8	10	8	15
23	7	57	8	02	8	06	8	12	8	17	8	23
23,31	8	00	8	05	8	10	8	16	8	21	8	27

A Table shewing the Semidiurnal-Arch, or the Time of Sun setting, when the Sun hath North Declination; and the Seminocturnal-Arch, or the Time of Sun-rising, when the Sun hath South Declination.

The Degrees of Latitude.

Decl.	Sun's	55	56	57	58	59	60
		H. M.	H. M.	H. M.	H. M.	H. M.	H. M.
0		6 00	6 00	6 00	6 00	6 00	6 00
1		6 06	6 06	6 06	6 06	6 07	6 07
2		6 11	6 12	6 12	6 13	6 13	6 14
3		6 17	6 18	6 19	6 19	6 20	6 21
4		6 23	6 24	6 25	6 26	6 27	6 28
5		6 29	6 30	6 31	6 32	6 33	6 35
6		6 35	6 36	6 37	6 39	6 40	6 42
7		6 40	6 42	6 44	6 45	6 47	6 49
8		6 46	6 48	6 50	6 52	6 54	6 56
9		6 52	6 54	6 56	6 59	7 01	7 04
10		6 58	7 00	7 03	7 06	7 08	7 11
11		7 04	7 07	7 10	7 13	7 16	7 19
12		7 11	7 13	7 16	7 20	7 23	7 26
13		7 17	7 20	7 23	7 27	7 30	7 34
14		7 23	7 27	7 30	7 34	7 38	7 42
15		7 30	7 34	7 38	7 42	7 46	7 51
16		7 37	7 41	7 45	7 49	7 54	7 59
17		7 44	7 48	7 52	7 57	8 03	8 08
18		7 51	7 55	8 00	8 05	8 11	8 17
19		7 58	8 03	8 08	8 14	8 20	8 26
20		8 05	8 10	8 16	8 22	8 29	8 36
21		8 13	8 19	8 25	8 32	8 39	8 47
22		8 21	8 27	8 34	8 41	8 49	8 58
23		8 29	8 36	8 43	8 51	9 00	9 09
23, 31		8 34	8 41	8 48	8 56	9 05	9 15

Degrees of Declination.

## The USE of the foregoing TABLES.

To find the Time of the Sun's Rising and Setting, with the Length of the Day and Night, by these Tables of Semidiurnal and Seminocturnal-Arches.

**FIRST**, seek the Sun's Declination, in the Tables of Declination, for the Day proposed, with which enter the Table of Semidiurnal and Seminocturnal-Arches, finding the Latitude of the Place, in the head of the Table, and the Degree of the Sun's Declination in the first Column on the Left-hand; and in the common Angle of Meeting is the Semidiurnal-Arch, if the Sun hath North Declination; or the Seminocturnal-Arch if the Sun hath South Declination.

*Example 1.* For Illustration hereof, let it be requir'd to find the Time of the Sun's Rising and Setting, with the Length of the Day and Night for the 23d Day of April 1716, in Latitude 46 deg. North.

At which Time the Sun's Declination is 16 deg. 1 m. North, with which enter the Table, as before is declared, and the Semidiurnal-Arch is 7 Hours 9 Min. the true Time of Sun-setting, whose Complement to twelve Hours, is the Seminocturnal-Arch, or the Time of Sun-rising, and is 4 Hours 51 Min. Double the Semidiurnal-Arch, you have the Length of the Day; Double the Seminocturnal-Arch, the Aggregate is the Length of the Night, See the Work following.

	H.	M.
The Semidiurnal-Arch, or Time of Sun-setting	12	00
	07	09

The Complement to twelve Hours ———— 04 51

Is the Seminocturnal-Arch, or Time of Sun-Rising,  
Latitude 46 Degrees. † The



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	H.	M.
The Semidiurnal Arch doubled	5	07 09
	2	07 09
The Length of the Day, <i>April 23, 1716</i>		14 18
The Seminocturnal Arch doubled	5	04 51
	2	04 51
Length of the Night, <i>April 23, 1716,</i>	5	09 42

*Example 2.* But when the Sun hath 16 deg. 1 min. South Declination in this Latitude of 46 deg.

Then the Day-Arch will be equal to the Night Arch, and the Night Arch will be equal to the Day Arch.

As on *October 26, 1716,* the Sun hath 16 deg. 2 min. South Declination, then the Time of the Sun's Rising is 7 hours 9 min. his Setting 4 hours 51 min. the Length of the Day 9 hours 42 min. and the Length of the Night 14 hours 18 min.

*Examp. 3.* Let it be required to find the Time of the Sun's Rising and Setting, with the Length of the Day and Night, for the 15th day of *December 1716,* in Latitude 53 deg. North; at which Time the Sun's Declination is 23 deg. 27 min. South.

	H.	M.
The Seminocturnal-Arch, or the Time of Sun-Rising	5	12 00
	2	08 21

The Complement to 12 Hours	03 39
----------------------------	-------

Is the Semidiurnal-Arch, or Time of Sun-setting.

The Semidiurnal-Arch doubled	5	03 39
	2	03 39

Length of the Day, <i>December 15, 1716</i>	07 18
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The Seminocturnal-Arch doubled	5	08 21
	2	08 21

The Length of the Night <i>December, 15, 1716.</i>	5	16 42
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These

These Tables will serve as well in *South* Latitude as in *North*, with this Alteration only. When in *South* Latitude, then use *South* Declination there, as you do *North* Declination here.

For then these Tables shew the Semidiurnal-Arch, or the Time of Sun-setting, when the Sun hath *South* Declination; and the Seminocturnal-Arch, or the Time of Sun-rising, when the Sun hath *North* Declination.

*Example 4.* Let it be required to find the Time of the Sun's Rising and Setting, with the Length of the Day and Night, for the 23d Day of *April* 1716, in Latitude 46 deg. *South*.

At which Time the Sun's Declination 16 deg. 1 min. *North*, with which enter the Table, and the Seminocturnal-Arch is 7 hours 9 min. the Time of Sun-rising, whose Complement to 12 hours, is the Semidiurnal-Arch, or the Time of Sun-setting, which is at 51 min. past 4 of the Clock.

	H.	M.
The Seminocturnal Arch doubled	12	09
	07	09
	07	09
The Length of the Night, <i>April</i> 23, 1716, Latitude 46 deg. <i>South</i>	14	18
The Semidiurnal Arch doubled	04	51
	04	51
The Length of the Day for the 23d of <i>April</i> 1716, Latitude 46 deg. <i>South</i>	09	42

*Example 5.* Let it be required to find the Time of the Sun's Rising and Setting, with the Length of the Day and Night, for the 15th of *December* 1716, in Latitude 53 deg. *South*. At which Time the Sun's Declination is 23 deg. 27 min. *South*; with which enter the Table of Semidiurnal-Arches, &c. and you will find as follows.

+

H. M

	H.	M.
The Semidiurnal Arch, or Time of Sun-setting. _____	12	00
	08	21
The Seminocturnal-Arch, or the Time of Sun-rising. _____	03	39
The Length of the Day, _____	16	42
Length of the Night, Decemb. 15, 1716, _____	07	18
Latitude 53, degrees South, _____		

*To find the Time of a Star's Rising or Setting.*

BY these Tables the Time of the Rising and Setting of all Stars in the Heavens, whose Declinations doth not exceed the Sun's greatest Declination, in any Latitude that the Tables contain, and at any Time of the Year, are found in this manner.

If the Star hath North Declination, and you in North Latitude, look for the Latitude in the head of the Table, the Declination on the Left-hand; and in the common Angle of Meeting, is the Star's Semidiurnal-Arch, or half the Time that Star doth continue above the Horizon in that Latitude; or the Distance of Time that Star is in going from the Horizon to the Meridian on the East-side; likewise from the Meridian to the Horizon on the West-side of the Meridian. Now if you subtract these Hours and Minutes from the Time of the Star's coming to the Meridian, the Remainder will be the Time of the Star's Rising; and if you add, the Sum will be the true Time of the Star's Setting.

*Example 6.* Let it be required to find the Time of the Rising and Setting of the Bull's-Eye, Novemb. 18, in the Latitude of 42 deg. North; The Declination of this Star is 15 deg. 47 min. North; the 18th Day of November this Star cometh on the Meridian at 12 a Clock at Night.

H. M.



	H.	M.
The Time of the Star's Southing	12	00
The Semidiurnal-Arch, subtract	06	59
Time of the Star's Rising in the Evening	05	01
Time of the Star's setting in the Morning	06	59

*Note*, 1. If the Sum of the Addition exceeds 12 hours, cast away 12 hours.

2. And when you can't subtract, add 12 hours to the Star's Southing, and then subtract, what remains is its setting.

*Example* 7. I desire to know the Time of the Rising and Setting of the *Bull's Eye*, the 18th Day of *November*, in the Latitude of 13 deg. *North*, The Declination of the *Bull's Eye*, is 15 deg. 47 min. *North*.

	H.	M.
The Time of its Southing	12	00
The Semidiurnal Arch, subtract	06	15
The Time of his Rising in the Evening	05	45
The Time of his Setting in the Morning	06	15

If the Star hath *South* Declination, and you in *North* Latitude, look (as before) the Latitude in the Head of the Table, the Declination on the Left-side; and in the common Angle of Meeting is the Star's Seminocturnal-Arch, which subtract from 12 Hours, the Remainder is the Star's Semidiurnal Arch, or half the Time that Star doth continue above the Horizon in that Latitude, therefore subtract those Hours and Minutes from the Time of the Star's coming to the Meridian, (adding 12 Hours to the Star's Southing, if otherwise Subtraction cannot be made) the Remainder will be the Time of the Star's Rising; and if you add, the Sum will be the Time of the Star's Setting.

*Example*



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*Example 8.* Let it be required to find the Time of the Rising and Setting of the bright Star in the *Great Dog's Mouth*, the 15th Day of November, in the Latitude of 50 deg. North. The Declination of the *Great Dog's Mouth*, is 16 deg. 15 min. South, and its South-ing, is two hours 26 min. in the Morning the 15th of November.

	H.	M.
The Time of this Star's Southing	02	26
To it add	12	00
The Sum is	14	26
The Seminocturnal-Arch by the Table, is	07	21
Which Subtract from	12	00
The Remainder is the Semidiurnal-Arch	04	39
Time of Southing with 12 hours added, is	14	26
The Semidiurnal-Arch, subtract	04	39
Time of the Star's Rising in the Evening	09	47
Time of the Star's Setting in the Morning	07	05

*Example 9.* I desire to know the Rising and Setting of the *Great Dog*, the 15th of November, in the Latitude of 33 Degrees North.

	H.	M.
Time of Southing, with 12 hours added	14	26
The Semidiurnal-Arch	05	22
Time of the Stars Rising in the Evening	09	04
Time of the Star's Setting in the Morning	07	48

*In South Latitude, to know the Time of the Rising and Setting of the Stars.*

**D**O with those Stars that have North Declination, in South Latitude, as with Stars that have South Declination, when in North Latitude.

*Examp.*

*Example 10.* Let it be required to find the Time of Rising and Setting of the *Bull's-Eye* the 18th Day of November, in the Latitude of 42 deg. South.

The Declination of this Star is 15 deg. 47 min. North;  
The 18th Day of November this Star cometh upon the Meridian at 12 of the Clock at Night. H. M.

The Seminocturnal-Arch by the Table, is, — 06 59  
Which subtract from ————— 12 00

The Remainder is the Semidiurnal-Arch — 05 01

The Time of the Star's Northing is ————— 12 00

The Semidiurnal-Arch, subtract ————— 05 01

Time of the Star's Rising in the Evening — 06 59

Time of the Star's Setting in the Morning — 05 01

In like manner may the Rising and Setting of any Star, (whose Declination exceedeth not the Sun's greatest) be found in any Latitude, from the Equinoctial to sixty Degrees.

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## ASTRONOMICAL TABLES SHEWING

The Point of the Compass that the Sun and Stars Rise  
and Set with, &c.

Being of excellent Use for the ready finding of the Variation of the Compass; and may be performed by an ordinary Meridian-Compass, but more exactly by an Azimuth Compass.

Fitting all Parts of the World, where the Pole is elevated not above 60 deg. either North or South

Latitude 0 Degrees						Latitude 1 Degree.					
North Declination.		Declination	South Declination.			North Declination		Declination	South Declination.		
◉ri.	◉set.	D M	◉ri.	◉set.		◉ri.	◉set.	D M	◉ri.	◉set.	
East	West	00.00	East	West		East	West	00.00	East	West	
1		02.49	1			1		02.49	1		
2		05.37	2			2		05.37	2		
3		08.26	3			3		08.26	3		
by n w by n		11.15	by s w by s			by n w by n		11.15	by s w by s		
1		14.04	1			1		14.04	1		
2		16.52	2			2		16.52	2		
3		19.41	3			3		19.41	3		
ne w n w		22.30	ese w s w			ne w n w		22.30	ese w s w		

Latitude 2 Degrees.						Latitude 3 Degrees.					
North Declination.		Declination	South Declination.			North Declination.		Declination	South Declination.		
◉ri.	◉set.	D M	◉ri.	◉set.		◉ri.	◉set.	D M	◉ri.	◉set.	
East	West	00.00	East	West		East	West	00.00	East	West	
1		02.49	1			1		02.49	1		
2		05.37	2			2		05.37	2		
3		08.26	3			3		08.25	3		
by n w by n		11.14	by s w by s			by n w by n		11.14	by s w by s		
1		14.03	1			1		14.03	1		
2		16.51	2			2		16.51	2		
3		19.40	3			3		19.39	3		
ne w n w		22.29	ese w s w			ne w n w		22.27	ese w s w		

Latitude 4 Degrees.						Latitude 5 Degrees.					
North Declination.		Declination	South Declination.			North Declination.		Declination	South Declination.		
⊙ri.	⊙set.	D M	⊙ri.	⊙set.		⊙ri.	⊙set.	D M	⊙ri.	⊙set.	
East	West	00.00	East	West		East	West	00.00	East	West	
1		02.48	1			1		02.48	1		
2		05.37	2			2		05.37	2		
3		08.25	3			3		08.24	3		
e by nw by n		11.14	e by s.w. by s			e by nw by n		11.12	e by s.w. by s		
1		14.02	1			1		14.01	1		
2		16.50	2			2		16.49	2		
3		19.38	3			3		19.36	3		
e ne wnw		22.26	e se ws w			e ne wnw		22.23	e se ws w		

Latitude 6 Degrees.						Latitude 7 Degrees.					
North Declination.		Declination	South Declination.			North Declination.		Declination	South Declination.		
⊙ri.	⊙set.	D M	⊙ri.	⊙set.		⊙ri.	⊙set.	D M	⊙ri.	⊙set.	
East	West	00.00	East	West		East	West	00.00	East	West	
1		02.48	1			1		02.48	1		
2		05.36	2			2		05.35	2		
3		08.23	3			3		08.20	3		
e by nw by n		11.11	e by s.w. by s			e by nw by n		11.09	e by s.w. by s		
1		13.59	1			1		13.58	1		
2		16.47	2			2		16.45	2		
3		19.23	3			3		19.31	3		
e ne wnw		22.21	e se ws w			e ne wnw		22.19	e se ws w		



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## Latitude 8 Degrees.

North Declination.		Declination.		South Declination.	
⊙ ri.	⊙ set.	D	M	⊙ ri.	⊙ set.
East	West	0.	0	East	West
1		2.47		1	
2		5.35		2	
3		8.18		3	
e by s	w by s	11. 8	e by n	w by n	
1		13.56		1	
2		16.43		2	
3		19.28		3	
e n e	w n w	22.15		e s e	w s w

## Latitude 9 Degrees

North Declination.		Declination.		South Declination.	
⊙ ri.	⊙ set.	D	M	⊙ ri.	⊙ set.
East	West	0.	0	East	West
1		2.47		1	
2		5.34		2	
3		8.17		3	
e by n	w b n	11. 6	e by s	w by s	
1		13.53		1	
2		16.40		2	
3		19.25		3	
e n e	w n w	22.12		e s e	w s w

## Latitude 10 degrees.

North Declination.		Declination.		South Declination.	
⊙ ri.	⊙ set.	D	M	⊙ ri.	⊙ set.
East	West	0.	0	East	West
1		2.47		1	
2		5.33		2	
3		8.16		3	
e by n	w by n	11. 5	e by s	w by s	
1		13.51		1	
2		16.37		2	
3		19.21		3	
e n e	w n w	22. 7		e s e	w s w

## Latitude 11 degrees.

North Declination.		Declination.		South Declination.	
⊙ ri.	⊙ set.	D	M	⊙ ri.	⊙ set.
East	West	0.	0	East	West
1		2.46		1	
2		5.31		2	
3		8.14		3	
e by n	w by n	11. 3	e by s	w by s	
1		13.48		1	
2		16.33		2	
3		19.18		3	
e n e	w n w	22. 3		e s e	w s w

Latitude 12 Degrees.						Latitude 13 Degrees.					
North Declination.			Declination.			North Declination.			Declination.		
⊙ ri.	⊙ set.	D M	⊙ ri.	⊙ set.		⊙ ri.	⊙ set.	D M	⊙ ri.	⊙ set.	
East	West	O. O	East	West		East	West	O. O	East	West	
1		2.45	1			1		2.45	1		
2		5.30	2			2		5.29	2		
3		8.12	3			3		8.10	3		
e by n w by n		11. 0	e by s w by s			e by n w by n		11.57	e by s w by s		
1		13.45	1			1		13.42	1		
2		16.30	2			2		16.26	2		
3		19.14	3			3		19. 9	3		
e n e w n w		21.58	e s e w s w			e n e w n w		21.53	e s e w s w		

Latitude 14 degrees.						Latitude 15 degrees.					
North Declination.			Declination.			North Declination.			Declination.		
⊙ ri.	⊙ set.	D M	⊙ ri.	⊙ set.		⊙ ri.	⊙ set.	D M	⊙ ri.	⊙ set.	
East	West	O. O	East	West		East	West	O. O	East	West	
1		2.44	1			1		2.43	1		
2		5.28	2			2		5.26	2		
3		8. 8	3			3		8. 6	3		
e by n w by n		10.55	e by s w by s			e by n w by n		10.52	e by s w by s		
1		13.38	1			1		13.35	1		
2		16.22	2			2		16.17	2		
3		19. 4	3			3		18.59	3		
e n e w n w		21.47	e s e w s w			e n e w n w		21.41	e s e w s w		

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Latitude 16 Degrees.						Latitude 17 Degrees					
North Declination.		Declination.		South Declination.		North Declination.		Declination.		South Declination.	
◉.ri.	◉.set.	D	M	◉.ri.	◉.set.	◉.ri.	◉.set.	D	M	◉.ri.	◉.set.
East	West	0.0		East	West	East	West	0.0		East	West.
1		2.42		1		1		2.42		1	
2		5.25		2		2		5.23		2	
3		8.3		3		3		8.1		3	
e by n w by		10.49		e by s w by		e by n w by		10.45		e by s w by	
1		13.31		1		1		13.26		1	
2		16.12		2		2		16.08		2	
3		18.53		3		3		18.47		3	
e n e w n w		21.34		e s e w s w		e n e w n w		21.27		e s e w s w	
1											

Latitude 18 Degrees.						Latitude 19 Degrees.					
North Declination.		Declination.		South Declination.		North Declination.		Declination.		South Declination.	
◉.ri.	◉.set.	D	N	◉.ri.	◉.set.	◉.ri.	◉.set.	D	M	◉.ri.	◉.set.
East	West	0.0		East	West	East	West	0.0		East	West
1		2.41		1		1		2.40		1	
2		5.25		2		2		5.20		2	
3		7.59		3		3		7.56		3	
e by n w by		10.42		e by s w by		e by n w by		10.38		e by s w by	
1		13.22		1		1		13.17		1	
2		16.2		2		2		15.56		2	
3		18.40		3		3		18.33		3	
e n e w n w		21.20		e s e w s w		e n e w n w		21.13		e s e w s w	

Latitude 20 Degrees.						Latitude 21 Degrees.					
North Declination.		Declination.		South Declination.		North Declination.		Declination.		South Declination.	
◉ri.	◉set.	D	M	◉ri.	◉set.	◉ri.	◉set.	D	M	◉ri.	◉set.
East	West	0.	0	East	West	East	West	0.	0	East	West
1		2.39		1		1		2.38		1	
2		5.17		2		2		5.15		2	
3		7.52		3		3		7.50		3	
e by n w by r		10.34		e by s w by s		e by n w by r		10.30		e by s w by s	
1		13.12		1		1		13.7		1	
2		15.51		2		2		15.44		2	
3		18.27		3		3		18.19		3	
e n e w n w		21.5		e s e w s w		e n e w n w		20.55		e s e w s w	
						1		23.32		1	

Latitude 22 Degrees.						Latitude 23 Degrees.					
North Declination.		Declination.		South Declination.		North Declination.		Declination.		South Declination.	
◉ri.	◉set.	D	M	◉ri.	◉set.	◉ri.	◉set.	D	M	◉ri.	◉set.
East	West	0.	0	East	West	East	West	0.	0	East	West
1		2.37		1		1		2.36		1	
2		5.13		2		2		5.11		2	
3		7.47		3		3		7.43		3	
e by n w by n		10.25		e by s w by s		e by n w by n		10.21		e by s w by s	
1		13.1		1		1		12.50		1	
2		15.38		2		2		15.31		2	
3		18.11		3		3		18.3		3	
e n e w n w		20.46		e s e w s w		e n e w n w		20.37		e s e w s w	
1		23.22		1		1		23.11		1	



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Latitude 24 Degrees.						Latitude 25 Degrees.					
North Declination.		Declination	South Declination.			North Declination.		Declination	South Declination.		
⊙ ri.	⊙ set.	D M	⊙ ri.	⊙ set.		⊙ ri.	⊙ set.	D M	⊙ ri.	⊙ set.	
East	West	0. 0	East	West		East	West	0. 0	East	West	
1		2.35	1			1		2.33	1		
2		5. 9	2			2		5. 6	2		
3		7.39	3			3		7.36	3		
e by n w by n		10.16	e by s w by s			e by n w by n		10.11	e by s w by s		
1		12.50	1			1		12.43	1		
2		15.23	2			2		15.16	2		
3		17.54	3			3		17.46	3		
e new n w		20.28	e s w s w			e new n w		20.18	e s w s w		
1		23. 0	1			1		22.48	1		

Latitude 26 Degrees.						Latitude 27 Degrees.					
North Declination.		Declination	South Declination.			North Declination.		Declination	South Declination.		
⊙ ri.	⊙ set.	D M	⊙ ri.	⊙ set.		⊙ ri.	⊙ set.	D M	⊙ ri.	⊙ set.	
East	West	0. 0	East	West		East	West	0. 0	East	West	
1		2.32	1			1		2.31	1		
2		5. 4	2			2		5. 1	2		
3		7.32	3			3		7.28	3		
e by n w by n		10. 6	e by s w by s			e by n w by n		10. 1	e by s w by s		
1		12.35	1			1		12.30	1		
2		15. 8	2			2		15. 0	2		
3		17.37	3			3		17.28	3		
e new n w		20. 7	e s w s w			e new n w		19.56	e s w s w		
1		22.36	1			1		22.23	1		

## The Mariners Compass Rectified.

Latitude 28 Degrees.						Latitude 29 Degrees.					
North Declination.		Declination		South Declination.		North Declination.		Declination		South Declination.	
⊙ ri.	⊙ set.	D	M	⊙ ri.	⊙ set.	⊙ ri.	⊙ set.	D	M	⊙ ri.	⊙ set.
East	West	0.	0	East	West	East	West	0.	0	East	West
1		2.29		1		1		2.28		1	
2		4.58		2		2		4.55		2	
3		7.24		3		3		7.20		3	
e by n w by n		9.55		e by s w by s		e by n w by n		9.50		e by s w by s	
1		12.24		1		1		12.17		1	
2		14.51		2		2		14.43		2	
3		17.17		3		3		17.7		3	
e new n w		19.45		e s e w s w		e new n w		19.33		e s e w s w	
1		22.11		1		1		21.58		1	

Latitude 30 Degrees.						Latitude 31 Degrees.					
North Declination.		Declination		South Declination.		North Declination.		Declination		South Declination.	
⊙ ri.	⊙ set.	D	M	⊙ ri.	⊙ set.	⊙ ri.	⊙ set.	D	M	⊙ ri.	⊙ set.
East	West	0.	0	East	West	East	West	0.	0	East	West
1		2.27		1		1		2.25		1	
2		4.52		2		2		4.50		2	
3		7.18		3		3		7.13		3	
e by n w by n		9.44		e by s w by s		e by n w by n		9.38		e by s w by s	
1		12.9		1		1		12.1		1	
2		14.34		2		2		14.39		2	
3		15.57		3		3		16.47		3	
e new n w		19.21		e s e w s w		e new n w		19.9		e s e w s w	
1		21.44		1		1		21.30		1	

# The Mariners Compass Rectified.

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Latitude 32 Degrees.						Latitude 33 Degrees.					
North Declination.		Declination	South Declination.			North Declination		Declination	South Declination		
◉ri.	◉set.	D M	◉ri.	◉set.		◉ri.	◉set.	D. M.	◉ri.	◉set.	
East	West	0. 0	East	West		East	West	0. 0	East	West	
1		2.23	1			1		2.22	1		
2		4.46	2			2		4.43	2		
3		7. 8	3			3		7. 4	3		
e by n w by n		9.31	e by s w by s			e by n w by n		9.25	e by s w by s		
1		11.54	1			1		11.46	1		
2		14.16	2			2		14.06	2		
3		16.36	3			3		16.24	3		
e n e w n w		18.55	e s e w s w			e n e w n w		18.43	e s e w s w		
1		21.16	1			1		21. 1	1		
						2		23.18	2		
									3		

Latitude 34 Degrees.						Latitude 35 Degrees.					
North Declination.		Declination	South Declination.			North Declination.		Declination	South Declination		
◉ri.	◉set.	D M	◉ri.	◉set.		◉ri.	◉set.	D M	◉ri.	◉set.	
East	West	0. 0	East	West		East	West	0. 0	East	West	
1		2.20	1			1		2.18	1		
2		4.40	2			2		4.37	2		
3		6.59	3			3		6.54	3		
e by n w by n		9.18	e by s w by s			e by n w by n		9.12	e by s w by s		
1		11.38	1			1		11.29	1		
2		13.56	2			2		13.46	2		
3		16.12	3			3		16. 2	3		
e n e w n w		18.30	e s e w s w			e n e w n w		18.16	e s e w s w		
1		20.46	1			1		20.30	1		
2		23. 1	2			2		22.43	2		

Latitude 36 Degrees.						Latitude 37 Degrees.					
North Declination.		Declination	South Declination.			North Declination.		Declination	South Declination.		
◉ri.	◉set.	D M	◉ri.	◉set.		◉ri.	◉set.	D.M.	◉ri.	◉set.	
East	West	0. 0	East	West		East	West	0. 0	East	West	
1		2.16	1			1		2.15	1		
2		4.33	2			2		4.30	2		
3		6.49	3			3		6.43	3		
e by n w by n		09.05	e by s w by s			e by n w by n		8.58	e by s w by s		
1		11.21	1			1		11.12	1		
2		13.35	2			2		13.25	2		
3		15.49	3			3		15.36	3		
e n e w n w		18. 2	e s e w s w			e n e w n w		17.48	e s e w s w		
1		20.15	1			1		19.58	1		
2		22.25	2			2		22. 7	2		

Latitude 38 Degrees.						Latitude 39 Degrees.					
North Declination.		Declination	South Declination.			North Declination.		Declination	South Declination.		
◉ri.	◉set.	D M	◉ri.	◉set.		◉ri.	◉set.	D M	◉ri.	◉set.	
East	West	0. 0	East	West		East	West	0. 0	East	West	
1		2.13	1			1		2.11	1		
2		4.26	2			2		4.22	2		
3		6.38	3			3		6.32	3		
e by n w by n		8.50	e by s w by s			e by n w by n		8.43	e by s w by s		
1		11. 3	1			1		10.53	1		
2		13.14	2			2		13. 3	2		
3		15.23	3			3		15.10	3		
e n e w n w		17.33	e s e w s w			e n e w n w		17.18	e s e w s w		
1		19.41	1			1		19.25	1		
2		21.49	2			2		21.30	2		
						3		23.32	3		



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Latitude 40 Degrees.						Latitude 41 degrees.					
North Declination.		Declination	South Declination.			North Declination.		Declination	South Declination.		
◉ri.	◉set.	D M	◉ri.	◉set.		◉ri.	◉set.	D M	◉ri.	◉set.	
East	West	0. 0	East	West		East	West	0. 0	East	West	
1		2. 9	1			1		2. 7	1		
2		4. 19	2			2		4. 15	2		
3		6. 27	3			3		6. 22	3		
e by n w by n		8. 36	e by s w by s			e by n w by n		8. 28	e by s w by s		
1		10. 43	1			1		10. 34	1		
2		12. 51	2			2		12. 40	2		
3		14. 57	3			3		14. 44	3		
e n e w n w		17. 3	e s e w s w			e n e w n w		16. 47	e s e w s w		
1		19. 7	1			1		18. 50	1		
2		21. 10	2			2		20. 51	2		
3		23. 11	3			3		22. 50	3		

Latitude 42 degrees.						Latitude 43 degrees.					
North Declination.		Declination	South Declination.			North Declination.		Declination	South Declination.		
◉ri.	◉set.	D M	◉ri.	◉set.		◉ri.	◉set.	D M	◉ri.	◉set.	
East	West	0. 0	East	West		East	West	0. 0	East	West	
1		2. 6	1			1		2. 4	1		
2		4. 11	2			2		4. 7	2		
3		6. 16	3			3		6. 10	3		
e by n w by n		8. 20	e by s w by s			e by n w by n		8. 12	e by s w by s		
1		10. 24	1			1		10. 14	1		
2		12. 28	2			2		12. 16	2		
3		14. 30	3			3		14. 16	3		
e n e w n w		16. 31	e s e w s w			e n e w n w		16. 15	e s e w s w		
1		18. 32	1			1		18. 14	1		
2		20. 31	2			2		20. 10	2		
3		22. 27	3			3		22. 5	3		

Latitude 44 Degrees.						Latitude 45 degrees.					
North Declination.		Declination	South Declination.			North Declination.		Declination	South Declination.		
Ori.	Set.	D M	Ori.	Set.		Ori.	Set.	D M	Ori.	Set.	
East	West	O. O	East	West		East	West	O. O	East	West	
1		2. 1	1			1		2. 0	1		
2		4. 3	2			2		3. 59	2		
3		6. 4	3			3		5. 57	3		
e by n w by n		8. 4	e by s w by s			e by n w by n		7. 56	e by s w by s		
1		10. 4	1			1		9. 54	1		
2		12. 3	2			2		11. 51	2		
3		14. 1	3			3		13. 46	3		
e n e w n w		15. 59	e s e w s w			e n e w n w		15. 42	e s e w s w		
1		17. 54	1			1		17. 36	1		
2		19. 50	2			2		19. 30	2		
3		21. 42	3			3		21. 19	3		
n e b e n w b w		23. 32	s e b e s w b w			n e b e n w b w		23. 8	s e b e s w b w		

Latitude 46 degrees.						Latitude 47 degrees.					
North Declination.		Declination	South Declination.			North Declination.		Declination	South Declination.		
Ori.	Set.	D M	Ori.	Set.		Ori.	Set.	D M	Ori.	Set.	
East	West	O. O	East	West		East	West	O. O	East	West	
1		1. 58	1			1		1. 55	1		
2		3. 55	2			2		3. 50	2		
		5. 51	3			3		5. 45	3		
e by n w by n		7. 47	e by s w by s			e by n w by n		7. 39	e by s w by s		
1		9. 43	1			1		9. 33	1		
2		11. 38	2			2		11. 25	2		
3		13. 32	3			3		13. 17	3		
e n e w n w		15. 25	e s e w s w			e n e w n w		15. 8	e s e w s w		
1		17. 17	1			1		16. 57	1		
2		19. 7	2			2		18. 46	2		
3		20. 55	3			3		20. 31	3		
n e b e n w b w		22. 42	s e b e s w b w			n e b e n w b w		22. 16	s e b e s w b w		

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Latitude 48 Degrees.						Latitude 49 Degrees.					
North Declination.		Declination.	South Declination.			North Declination.		Declination.	South Declination.		
◉ ri.	◉ set.	D M	◉ ri.	◉ set.		◉ ri.	◉ set.	D M	◉ ri.	◉ set.	
East	West	0. 0	East	West		East	West	0. 0	East	West	
1		1.53	1			1		1.51	1		
2		3.46	2			2		3.42	2		
3		5.38	3			3		5.31	3		
e by n w by n		7.30	e by s w by s			e by n w by n		7.22	e by s w by s		
1		9.22	1			1		9.10	1		
2		11.12	2			2		10.59	2		
3		13. 1	3			3		12.46	3		
e n e w n w		14.50	e s e w s w			e n e w n w		14.28	e s e w s w		
1		16.38	1			1		16.17	1		
2		18.24	2			2		18. 1	2		
3		20. 7	3			3		19.42	3		
n e b e n w b w		21.49	s e b e s w b w			n e b e n w b w		21.22	s e b y e s w b w		
1		23.29	1			1		23. 1	1		

Latitude 50 degrees.						Latitude 51 degrees.					
East	West	0. 0	East	West		East	West	0. 0	East	West	
1		1.48	1			1		1.46	1		
2		3.37	2			2		3.33	2		
3		5.25	3			3		5.18	3		
e by n w by n		7.12	e by s w by s			e by n w by n		7. 4	e by s w by s		
1		8.55	1			1		8.48	1		
2		10.46	2			2		10.32	2		
3		12. 3	3			3		12.14	3		
e n e w n w		14.14	e s e w s w			e n e w n w		13.56	e s e w s w		
1		15.57	1			1		15.36	1		
2		17.39	2			2		17.16	2		
3		19.18	3			3		18.52	3		
n e b e n w b w		20.55	s e b y e s w b w			n e b e n w b w		20.28	s e b y e s w b w		
1		22.31	1			1		22. 1	1		
						2		23.32	2		

Latitude 52 degrees.						Latitude 53 Degrees.					
North Declination.		Declination	South Declination.		Declination	North Declination.		Declination	South Declination.		Declination
⊙ ri.	⊙ set.	D M	⊙ ri.	⊙ set.		⊙ ri.	⊙ set.	D M	⊙ ri.	⊙ set.	
East	West	O. O	East	West		East	West	O. O	East	West	
1		1.44	1			1		1.42	1		
2		3.28	2			2		3.23	2		
3		5.11	3			3		5.4	3		
e by n w by n		6.54	e by s w by s			e by n w by n		6.44	e by s w by s		
1		8.37	1			1		8.25	1		
2		10.18	2			2		10.4	2		
3		11.58	3			3		11.41	3		
e n e w n w		13.37	e s e w s w			e n e w n w		13.19	e s e w s w		
1		15.16	1			1		14.55	1		
2		16.52	2			2		16.29	2		
3		18.27	3			3		18.1	3		
n e b e n w b w		20.0	s e b e s w b w			n e b e n w b w		19.32	s e b y e s w b w		
1		21.31	1			1		21.1	1		
2		23.0	2			2		22.27	2		

Latitude 54 degrees.						Latitude 55 degrees.					
East		West	O. O	East		West	O. O	East		West	O. O
1		1.39		1		1		1.37		1	
2		3.18		2		2		3.14		2	
3		4.57		3		3		4.49		3	
e by n w by n		6.35		e by s w by s		e by n w by n		6.25		e by s w by s	
1		8.13		1		1		8.1		1	
2		9.50		2		2		9.35		2	
3		11.25		3		3		11.8		3	
e n e w n w		13.0		e s e w s w		e n e w n w		12.41		e s e w s w	
1		14.33		1		1		14.12		1	
2		16.5		2		2		15.42		2	
3		17.39		3		3		17.9		3	
n e b e n w b w		19.3		s e b y e s w b w		n e b e n w b w		18.35		s e b y e s w b w	
1		20.30		1		1		19.59		1	
2		21.54		2		2		21.21		2	
3		23.15		3		3		22.39		3	



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## Latitude 56 Degrees.

North Declination.		Declination South		Declination.	
ori.	set.	D	M	ori.	set.
East	West	00.00		East	West
1		01.34		1	
2		03.09		2	
3		04.42		3	
e by nw by n		06.16		e by sw by s	
1		07.49		1	
2		09.21		2	
3		10.51		3	
ene wn w		12.22		ene wn w	
1		13.50		1	
2		15.18		2	
3		16.42		3	
ne be nw bw		18.06		ne be sw bw	
1		19.28		1	
2		20.47		2	
3		22.03		3	
ne n w		23.18		se s w	

## Latitude 57 Degrees.

North Declination.		Declination South		Declination.	
ori.	set.	D	M	ori.	set.
East	West	00.00		East	West
1		01.32		1	
2		03.04		2	
3		04.35		3	
e by nw by n		06.06		e by sw by s	
1		07.36		1	
2		09.06		2	
3		10.34		3	
ene wn w		12.01		ene wn w	
1		13.28		1	
2		14.53		2	
3		16.16		3	
ne be nw bw		17.37		ne be sw bw	
1		18.56		1	
2		20.13		2	
3		21.27		3	
ne n w		22.39		se s w	

## Latitude 58 Degrees.

North Declination.		Declination South		Declination.	
ori.	set.	D	M	ori.	set.
East	West	00.00		East	West
1		01.30		1	
2		02.59		2	
3		04.28		3	
e by nw by n		05.56		e by sw by s	
1		07.24		1	
2		08.51		2	
3		10.17		3	
ene wn w		11.42		ene wn w	
1		13.06		1	
2		14.28		2	
3		15.48		3	
ne be nw bw		17.07		ne be sw bw	
1		18.24		1	
2		19.38		2	
3		20.50		3	
ne n w		22.00		se s w	
1		23.08		1	

## Latitude 59 Degrees.

North Declination.		Declination South		Declination.	
ori.	set.	D	M	ori.	set.
East	West	00.00		East	West
1		01.27		1	
2		02.54		2	
3		04.20		3	
e by nw by n		05.46		e by sw by s	
1		07.11		1	
2		08.36		2	
3		10.00		3	
ene wn w		11.22		ene wn w	
1		12.42		1	
2		14.03		2	
3		15.21		3	
ne be nw bw		16.37		ne be sw bw	
1		17.52		1	
2		19.04		2	
3		20.14		3	
ne n w		21.22		se s w	
1		22.26		1	
2		23.27		2	

Latitude 60 Degrees.

North Declination.			South Declination.		
⊙.ri.	D M	⊙.set.	⊙.ri.	D M	⊙.set.
East	00.00	West	East	00.00	West
1	01.25	1	1	01.25	1
2	02.49	2	2	02.49	2
3	04.12	3	3	04.12	3
e by n	05.36	w by n	e by s	05.36	w by s
1	06.59	1	1	06.59	1
2	08.21	2	2	08.21	2
3	09.42	3	3	09.42	3
e n e	11.02	w n w	e s e	11.02	w s w
1	12.21	1	1	12.21	1
2	13.38	2	2	13.38	2
3	14.53	3	3	14.53	3
n e by e	16.18	n w by w	s e by e	15.18	s w by w
1	17.20	1	1	17.20	1
2	18.30	2	2	18.30	2
3	19.38	3	3	19.38	3
n e	20.42	n w	s e	20.42	s w
1	21.45	1	1	21.45	1
2	22.44	2	2	22.44	2

## *The Description and Use of the foregoing* TABLES.

1. **T**Hese Tables of Points of the Compass, at which the *Sun*, or any *Star*, whose Declination exceeds not 23 d. 30 m. begin at Latitude 0 Degree and proceeding orderly to 60 Degrees, (being some 4, some 2 Tables in one Page) are 61 in all.

2. In each Table are 5 Columns, the middlemost contains the Degrees of Declination, either North or South; those 2 on the left hand of it is *Sun-Rising* and *Sun-Setting*, under North Declination; and on the right hand is the like, under South Declination.

3. The

3. The 1<sup>st</sup> and 2<sup>d</sup> Columns (under North Declination) as also the 4<sup>th</sup> and 5<sup>th</sup> (under South Declination) contain the Points, and each quarter of a Point of the Compass, of both *Rising* and *Setting*; Thus *East* | *West*, under which is 1, 2, 3; that is *East*, or *West* 1 quarter, 2 quarters, 3 quarters *Northerly*, *Southerly*, then *E. by N.* *W. by N.* under which is 1, 2, 3; that is *E. by N.* or *W.* and by *N.* 1 quarter, 2 quarters *Northerly*, &c.

These Tables are ready Helps to find the Variation of the Compass with ease and sufficient exactness; evidently made out in the following Uses.

To find the Point of the Compass that the Sun riseth or sets at in any time of the Year.

First seek the Sun's Declination in the Table of Declination for the Time proposed; with which enter the foregoing Table, finding the Latitude in the head of the Table, and the Declination in the 3<sup>d</sup> Column; against which, on the Left-hand, if it be North Declination, but on the Right-hand, if it be South Declination, is the Point of the Compass that the Sun rises or sets at, according to the Titles at the head of the Table.

Note, These Tables shew the true Points of the Sun's Rising or Setting; so that you may readily know at any time, seeing the Sun rise or set, the Variation by an ordinary Meridian Compass.

There are some Compasses not touched so well as they ought to be: others in time, the Virtue of the Stone wears off from the Needle.

Now by these foregoing Tables, you may very readily discover any of these Defects.

But it may be objected, they cannot set the Sun by an ordinary Meridian Compass, so near as is required.

To this I answer; It is as easy to set the Sun by the Compass, as steer a Ship by it: For expert Sea-men can set the Sun, or a Headland, to near a quarter of a Point,

by their Hand (but with Sights much nearer the Truth.)  
The Posture to observe in such a Case, I advise, is thus ;

Set the Compass about two Foot high ; and directing your Hand towards the Sun, note what *Point, half Point, or quarter Point*, the Sun riseth or setteth on ; then, in that Table belonging to the Latitude, see whether the Sun riseth or sets that Day upon the same Point, found by Observation : If they agree there is no Variation ; but if they do not agree, the Compass is not true, or there is Variation ; and the Variation is so much as is the Difference between the Observation and the Table.

Example 1. *Admit in Latitude 30 d. the Sun having 9 d. 44 m. North Declination ; I observe the Sun that Day to rise upon the E. N. E. Point of the Compass ; I demand the Variation ?*

In the head of the Foregoing Tables, look for the Latitude 30 Degrees, and in the third Column for 9d. 44m. North Declination ; against it (under Sun rise) is E. by N. which sheweth that there is one Point Variation. For it appears by the Table, that the E. N. E. Point on the Compass, is the true E. by N. Point ; and the E. by N. (as it is upon the Compass) is the true *East-Point* ; the *East-Point* is the true E. by S. the S. E. is the S. E. by S. and the South is the S. by W. the *West* is the W. by N. and the North is the N. by E.

This plainly appears by the *Rectifier*, if you bring the E. by N. on the outward Circle, to touch the E. N. E. on the inward Circle.

Now, suppose we were to observe the Sun at his setting, in the Latitude of 30 deg. with Declination 9 deg. 44 min. North, as abovesaid, we should find the Sun to set exactly *West* by the Compass, although in the Morning we did find the Sun to rise at E. N. E. I know this will be little less than a Contradiction to some ; but if you cast your Eye upon the *Rectifier*, you may see it is a certain Truth.

*Example*



*Example 2.* In Latitude 37 d. the Sun's Declination 8 d. 58 m. North I observe the Sun to rise E. by N. by the Compass; I demand the Variation?

In the Table that belongs to 37 d. against 8 d. 58 m. N. Declination (and under the Sun-rise) is E. by N; which sheweth (seeing the Observation doth agree with the Table) there is no Variation.

*Note,* if the Declination for the Day proposed be not the same with the Declination in the Tables, then have regard to the nearest, allowing for the Difference.

*Example 3.* In Latitude 37 d. om. suppose the Declination 10 d. 15 m. N. I demand the Point of the Compass that the Sun should rise with?

In the Table the nearest to 10 d. 15 m. is 11 d. 12 m. against which the Sun riseth E. by N.  $\frac{1}{4}$  N. and sets W. by N.  $\frac{1}{4}$  N. but because the Declination proposed, is near about the middle between 8 d. 48 m. and 11 d. 12 min. therefore the Sun riseth E. by N. half a quarter N. and setteth W. by N. half a quarter N.

Understand the like in any other case, let the Declination be what it will, in any other Latitude.

*Example 4.* Admit in the Latitude 38 d. 20 m. and Declination 19 d. 50 m. South. The Sun riseth upon the E. S. E. Point of the Compass; I demand the Variation?

In the Table for Latitude 38 d. and against 19 d. 41 m. (the nearest to the given Declination) is E. S. E. a quarter S; which sheweth, that there is a quarter of a Point Variation: For the E. S. E. Point is the E. S. E.  $\frac{1}{4}$  S. and the North Point is N.  $\frac{1}{4}$  E: For if you do bring E. S. E.  $\frac{1}{4}$  S. on the outward Circle of the Rectifier, to touch E. S. E. on the inward Circle, then S. S. W. on the Compass, is S. S. W.  $\frac{1}{4}$  W. and S. E. is S. E.  $\frac{1}{4}$  S. and East is East  $\frac{1}{4}$  S; and so for any other Point, half Point, or quarter Point; by casting your Eye upon the Rectifier.

*Note,* The Tables shew the true Points of rising and setting, and the outward Circle on the Rectifier doth the same:

the same: But the Compass, when it differeth from the Tables, sheweth a false Point; and the inward Circle on the *Rectifier* doth the same.

*Example 5.* Admit in the Latitude 47 d. 24. m. the Declination 15 d. 2 m. *South*, the Sun Rising is E. by S. by the Compass; I demand the Variation?

By the Tables the Sun should rise E. S. E. therefore there is one Point Variation: For if you bring the E. S. E. on the outward Circle of the *Rectifier*, to touch the E. by S. on the inward, then the N. by W. on the Compass, is the true North Point: the N. W. is the N. W. by N. and the S. by E. is the true South Point.

By this time, I suppose my Reader able to discover how much the Variation is, and how to reckon it, without any Geometrical Demonstration. or Arithmetical Calculation.

*Note,* If you have any odd minutes of Latitude, go to that Table nearest the Latitude you are in.

I come now to resolve a Question some are puzzled with; and that is this.

*Quest.* If the Sun rise at E. N. E. in any Latitude, should he not set the same Day at W. N. W. in the same Latitude?

*Ans.* If there be no variation, it will; but if there be Variation, it will not be so: The reason is evident by the *Rectifier*.

By these Tables you may know the Point of the Compass, that any of the Stars do rise and set within any Latitude (the Tables contain) either North or South; if their Declination do not exceed the Sun's greatest Declination.

*Example 6.* Let it be required to find the Point of the Compass the *Bull's-Eye* rises and sets with, in the Latitude of 50 Degrees?

The Declination of this Star is 15 d. 47 m. North; in the Table that belongs to 50 d. against 15 d. 47 m. North Declination, the Point of rising is E. N. E.  $\frac{1}{4}$  N. and the Point of setting W. N. W.  $\frac{1}{4}$  N.

Understand

Understand the like for any other Star, whose Declination exceeds not the Sun's greatest Declination.

*The Use of the RECTIFIER.*

**T**HIS Instrument, as before Described in Page 91, and 92, containeth two Circles or Compasses one within the other; but as it is made in Wood, the one moveth upon the other; and by it the Compass when it doth vary, may be rectified as followeth.

Bring the true Point of Rising or Setting (as the Table sheweth) on the outward or under Compass, to touch the false Point of Rising or Setting (as your Compass sheweth) on the inward or upper Compass; then will the under Compass rectify the upper.

*Example 7.* Admit in Latitude 45 degrees the Sun's Declination being 7 deg. 56 min. South, the Sun setting upon the W. by N. Point of the Compass; I demand the Variation.

The Sun (if there be no Variation) will set at W. by S. and rise at E. by S. as the Table sheweth: therefore it appears there is two Points Variation.

Bring the W. by S. Point on the outward Compass to touch the W. by N. Point on the inward Compass: Then the Points upon the outward Compass, do explain the Points that are upon the inward, so that according to the foregoing Observation, the N. N. E. Point on the Compass, is the true North; the North is the true N. N. W; the W. by N. is the true W. by S. the S. E. by E. is the true E. by S. and so for any other Point of the Compass, by only looking on the Rectifier.

And thus you may rectify the Compass, without reckoning which way the Variation is, either Eastward or Westward; the Rectifier doth that so plain, that you cannot be mistaken.

This Rectifier is made in Wood, by James Atkinson at Cherry-Garden-Stairs, on Rotherith-Wall; also all sorts of Mathematical Books, and Instruments, are there Sold.



A TABLE of Amplitudes, fitting all Places from the Equinoctial to 60 Degrees of Latitude, either North or South.

## The Degrees of Latitude.

Sun's Decl.	1	2	3	4	5	6
	D. M.	D. M.	D. M.	D. M.	D. M.	D. M.
0	00 00	00 00	00 00	00 00	00 00	00 00
1	01 00	01 00	01 00	01 00	01 00	01 00
2	02 00	02 00	02 00	02 00	02 00	02 00
3	03 00	03 00	03 00	03 00	03 00	03 01
4	04 00	04 00	04 00	04 00	04 01	04 01
5	05 00	05 00	05 00	05 00	05 01	05 01
6	06 00	06 00	06 00	06 01	06 01	06 02
7	07 00	07 00	07 00	07 01	07 01	07 02
8	08 00	08 00	08 01	08 01	08 02	08 02
9	09 00	09 00	09 01	09 01	09 02	09 02
10	10 00	10 00	10 01	10 01	10 02	10 03
11	11 00	11 00	11 01	11 01	11 02	11 03
12	12 00	12 00	12 01	12 01	12 03	12 04
13	13 00	13 00	13 01	13 01	13 03	13 04
14	14 00	14 00	14 01	14 02	14 03	14 04
15	15 00	15 00	15 01	15 02	15 03	15 05
16	16 00	16 00	16 01	16 02	16 04	16 05
17	17 00	17 00	17 01	17 02	17 04	17 05
18	18 00	18 00	18 01	18 02	18 04	18 06
19	19 00	19 00	19 01	19 02	19 04	19 06
20	20 00	20 00	20 02	20 03	20 05	20 06
21	21 00	21 00	21 02	21 03	21 05	21 07
22	22 00	22 00	22 02	22 03	22 05	22 07
23	23 00	23 00	23 02	23 03	23 05	23 08
23, 31	23 31	23 32	23 33	23 35	23 37	23 39

Degrees of Declination.



A TABLE of Amplitudes, fitting all Places from the Equinoctial to 60 Degrees of Latitude, either North or South.

The Degrees of Latitude.

Decl.	Sun's	7	8	9	10	11	12
		D. M.	D. M.	D. M.	D. M.	D. M.	D. M.
0		00 00	00 00	00 00	00 00	00 00	00 00
1		01 00	01 00	01 00	01 01	01 01	01 01
2		02 01	02 01	02 01	02 02	02 02	02 03
3		03 01	03 01	03 01	03 03	03 03	03 04
4		04 02	04 02	04 02	04 04	04 04	04 05
5		05 02	05 02	05 03	05 05	05 05	05 07
6		06 02	06 03	06 04	06 06	06 06	06 08
7		07 03	07 04	07 05	07 07	07 08	07 09
8		08 03	08 04	08 06	08 08	08 09	08 11
9		09 04	09 05	09 06	09 09	09 10	09 12
10		10 04	10 06	10 07	10 10	10 11	10 13
11		11 05	11 06	11 08	11 11	11 13	11 15
12		12 05	12 07	12 09	12 12	12 14	12 16
13		13 06	13 08	13 09	13 13	13 15	13 17
14		14 06	14 08	14 10	14 14	14 16	14 19
15		15 07	15 09	15 11	15 15	15 17	15 20
16		16 07	16 10	16 12	16 16	16 19	16 22
17		17 08	17 10	17 13	17 17	17 20	17 23
18		18 08	18 11	18 14	18 18	18 21	18 25
19		19 09	19 12	19 15	19 19	19 22	19 26
20		20 09	20 12	20 16	20 20	20 24	20 28
21		21 10	21 13	21 17	21 21	21 25	21 29
22		22 10	22 13	22 18	22 22	22 27	22 31
23		23 11	23 14	23 19	23 23	23 28	23 33
23, 31		23 42	23 46	23 50	23 54	23 59	24 05

*A TABLE of Amplitudes, fitting all Places from the Equinoctial to 60 Degrees of Latitude, either North or South.*

The Degrees of Latitude.

Decl. Sun's	13	14	15	16	17	19
	D. M.	D. M.	D. M.	D. M.	D. M.	D. M.
0	00 00	00 00	00 00	00 00	00 00	00 00
1	01 02	01 02	01 02	01 02	01 02	01 03
2	02 03	02 04	02 04	02 05	02 03	02 06
3	03 05	03 05	03 06	03 07	03 08	03 09
4	04 06	04 07	04 08	04 10	04 11	04 12
5	05 08	05 09	05 10	05 12	05 13	05 15
6	06 10	06 11	06 13	06 15	06 17	06 19
7	07 11	07 13	07 15	07 17	07 19	07 22
8	08 13	08 15	08 17	08 19	08 22	08 25
9	09 14	09 17	09 19	09 22	09 25	09 28
10	10 16	10 19	10 21	10 24	10 28	10 31
11	11 17	11 20	11 23	11 27	11 30	11 34
12	12 19	12 22	12 25	12 29	12 33	12 38
13	13 20	13 24	13 27	13 32	13 36	13 41
14	14 22	14 26	14 30	14 34	14 39	14 44
15	15 24	15 28	15 32	15 37	15 42	15 47
16	16 26	16 30	16 35	16 40	16 45	16 51
17	17 28	17 32	17 37	17 42	17 48	17 54
18	18 30	18 34	18 39	18 45	18 51	18 58
19	19 31	19 36	19 42	19 48	19 54	20 01
20	20 33	20 38	20 44	20 51	20 57	21 04
21	21 35	21 40	21 46	21 53	22 00	22 08
22	22 37	22 43	22 49	22 56	23 04	23 12
23	23 39	23 45	23 51	23 58	24 06	24 15
23, 31	24 11	24 17	24 24	24 32	24 40	24 49

A TABLE of Amplitudes, fitting all Places from the Equinoctial to 60 Degrees of Latitude, either North or South.

The Degrees of Latitude.

Decl.	Sun's	19	20	21	22	23	2
		D. M.	D. M.	D. M.	D. M.	D. M.	D. M.
	0	00 00	00 00	00 00	00 00	00 00	00 00
	1	01 03	01 04	01 04	01 05	01 05	01 06
	2	02 07	02 08	02 08	02 09	02 10	02 12
	3	03 10	03 12	03 13	03 14	03 15	03 17
	4	04 14	04 16	04 17	04 19	04 21	04 23
	5	05 17	05 19	05 21	05 23	05 26	05 28
	6	06 21	06 23	06 26	06 28	06 31	06 34
	7	07 24	07 27	07 30	07 33	07 37	07 40
	8	08 28	08 31	08 34	08 38	08 42	08 46
	9	09 31	09 35	09 39	09 43	09 47	09 51
	10	10 35	10 39	10 43	10 48	10 52	10 57
	11	11 38	11 43	11 48	11 53	11 58	12 03
	12	12 42	12 47	12 52	12 58	13 03	13 09
	13	13 46	13 51	13 57	14 03	14 09	14 15
	14	14 50	14 55	15 01	15 08	15 14	15 21
	15	15 53	16 00	16 06	16 13	16 20	16 27
	16	16 57	17 04	17 11	17 18	17 26	17 34
	17	18 01	18 08	18 15	18 23	18 31	18 40
	18	19 05	19 12	19 20	19 28	19 37	19 46
	19	20 08	20 16	20 24	20 33	20 42	20 52
	20	21 12	21 20	21 29	21 39	21 49	21 59
	21	22 16	22 25	22 34	22 44	22 55	23 07
	22	23 20	23 29	23 39	23 50	24 01	24 12
	23	24 24	24 34	24 44	24 55	25 07	25 19
	23,31	24 58	25 08	25 18	25 29	25 41	25 54

Degrees of Declination.

A TABLE of Amplitudes, fitting all Places from the Equinoctial to 60 Degrees of Latitude, either North or South.

The Degrees of Latitude.

Sun's Decl.	25	26	27	28	29	30
	D. M.	D. M.	D. M.	D. M.	D. M.	D. M.
0	00 00	00 00	00 00	00 00	00 00	00 00
1	01 06	01 07	01 08	01 08	01 09	01 09
2	02 12	02 13	02 15	02 16	02 17	02 18
3	03 18	03 20	03 22	03 24	03 26	03 28
4	04 25	04 27	04 29	04 32	04 34	04 37
5	05 31	05 34	05 37	05 40	05 43	05 46
6	06 37	06 41	06 44	06 48	06 52	06 56
7	07 43	07 47	07 51	07 56	08 01	08 06
8	08 50	08 54	08 59	09 04	09 09	09 15
9	09 56	10 01	10 06	10 12	10 18	10 24
10	11 03	11 08	11 14	11 21	11 27	11 34
11	12 09	12 15	12 21	12 28	12 36	12 44
12	13 16	13 28	13 30	13 37	13 45	13 53
13	14 22	14 30	14 37	14 45	14 54	15 03
14	15 29	15 37	15 45	15 54	16 03	16 12
15	16 35	16 44	16 53	17 03	17 12	17 23
16	17 42	17 51	18 01	18 11	18 21	18 32
17	18 49	18 59	19 09	19 20	19 31	19 43
18	19 56	20 06	20 17	20 29	20 41	20 54
19	21 02	21 13	21 25	21 38	21 51	22 05
20	22 10	22 22	22 34	22 48	23 02	23 16
21	23 18	23 30	23 43	23 57	24 12	24 27
22	24 24	24 37	24 51	25 06	25 22	25 38
23	25 32	25 46	25 01	26 16	26 32	26 49
23, 31	26 08	26 23	26 29	26 46	27 03	27 21

Degrees of Declination.



A TABLE of Amplitudes, fitting all Places from the Equinoctial to 60 Degrees of Latitude, either North or South.

The Degrees of Latitude.

Decl.	Sun's	31	32	33	34	35	36
		D. M.	D. M.	D. M.	D. M.	D. M.	D. M.
0		00 00	00 00	00 00	00 00	00 00	00 00
1		01 10	01 10	01 11	01 12	01 13	01 14
2		02 19	02 21	02 23	02 25	02 27	02 29
3		03 30	03 33	03 35	03 38	03 40	03 43
4		04 40	04 43	04 46	04 50	04 53	04 57
5		05 50	05 54	05 58	06 02	06 06	06 11
6		07 00	07 05	07 10	07 15	07 20	07 25
7		08 11	08 16	08 21	08 27	08 33	08 40
8		09 21	09 27	09 33	09 39	09 46	09 54
9		10 31	10 38	10 45	10 52	11 00	11 08
10		11 41	11 48	11 55	12 03	12 12	12 21
11		12 52	13 00	13 09	13 18	13 28	13 39
12		14 02	14 11	14 21	14 32	14 43	14 54
13		15 13	15 23	15 33	15 44	15 56	16 09
14		16 22	16 33	16 45	16 57	17 10	17 24
15		17 34	17 46	17 58	18 11	18 25	18 40
16		18 44	18 57	19 11	19 25	19 40	19 55
17		19 56	20 10	20 24	20 39	20 55	21 11
18		21 07	21 21	21 36	21 53	22 10	22 27
19		22 19	22 34	22 50	23 07	23 25	23 44
20		23 31	23 47	24 04	24 22	24 41	25 00
21		24 43	25 00	25 18	25 37	25 56	26 17
22		25 55	26 13	26 32	26 52	27 13	27 35
23		27 07	27 26	27 46	28 07	28 29	28 52
23, 31		27 40	28 00	28 21	28 43	29 07	29 31

Degrees of Declination.

*A TABLE of Amplitudes, fitting all Places from the Equinoctial to 60 Degrees of Latitude, either North or South.*

The Degrees of Latitude.

Decl.	Sun's	37	38	39	40	41	42
		D. M.	D. M.	D. M.	D. M.	D. M.	D. M.
0		00 00	00 00	00 00	00 00	00 00	00 00
1		01 15	01 16	01 17	01 18	01 20	01 21
2		02 30	02 32	02 34	02 36	02 39	02 41
3		03 45	03 48	03 51	03 54	03 58	04 02
4		05 00	05 04	05 08	05 13	05 18	05 23
5		06 16	06 21	06 26	06 32	06 38	06 44
6		07 31	07 37	07 43	07 50	07 57	08 05
7		08 47	08 54	09 01	09 09	09 17	09 26
8		10 02	10 10	10 19	10 28	10 37	10 47
9		11 17	11 27	11 37	11 47	11 58	12 09
10		12 32	12 43	12 54	13 06	13 18	13 31
11		13 50	14 01	14 13	14 26	14 39	14 53
12		15 06	15 18	15 31	15 45	16 00	16 15
13		16 22	16 35	16 49	17 04	17 20	17 37
14		17 38	17 52	18 08	18 24	18 42	19 00
15		18 55	19 11	19 28	19 45	20 04	20 23
16		20 11	20 28	20 46	21 05	21 25	21 46
17		21 28	21 46	22 06	22 26	22 48	23 10
18		22 46	23 05	23 25	23 47	24 10	24 34
19		24 04	24 24	24 46	25 09	25 33	25 58
20		25 21	25 43	26 06	26 30	26 56	27 24
21		26 39	27 02	27 27	27 53	28 21	28 50
22		27 58	28 23	28 49	29 16	29 45	30 16
23		29 17	29 43	30 11	30 40	31 11	31 43
23, 31		29 57	30 24	30 52	31 22	31 54	32 28

*A TABLE of Amplitudes, fitting all Places from the Equinoctial to 60 Degrees of Latitude, either North or South.*

*The Degrees of Latitude.*

<i>Decl.</i> <i>Sun's</i>	43	44	45	46	47	48
	D. M.	D. M.	D. M.	D. M.	D. M.	D. M.
0	00 00	00 00	00 00	00 00	00 00	00 00
1	01 22	01 23	01 25	01 26	01 28	01 29
2	02 44	02 47	02 50	02 53	02 56	02 59
3	04 06	04 10	04 15	04 19	04 24	04 29
4	05 28	05 34	05 40	05 46	05 52	05 59
5	06 51	06 58	07 05	07 12	07 20	07 29
6	08 13	08 21	08 30	08 39	08 49	08 59
7	09 35	09 45	09 56	10 06	10 18	10 30
8	10 58	11 09	11 21	11 34	11 47	12 00
9	12 21	12 34	12 47	13 01	13 16	13 31
10	13 44	13 58	14 13	14 28	14 44	15 02
11	15 07	15 22	15 38	15 55	16 15	16 34
12	16 31	16 48	17 06	17 25	17 45	18 06
13	17 55	18 13	18 33	18 54	19 16	19 39
14	19 18	19 39	20 00	20 23	20 47	21 12
15	20 43	21 05	21 28	21 52	22 18	22 45
16	22 08	22 32	22 56	23 23	23 50	24 20
17	23 34	23 59	24 25	24 53	25 23	25 55
18	24 59	25 26	25 54	26 25	26 57	27 31
19	26 25	26 54	27 25	27 58	28 32	29 07
20	27 53	28 23	28 56	29 31	30 07	30 45
21	29 20	29 53	30 27	31 03	31 42	32 23
22	30 48	31 22	31 58	32 37	33 18	34 03
23	32 16	32 51	33 30	34 12	34 56	35 43
23,31	33 03	33 40	34 20	35 03	35 48	36 35

*Degrees of Declination.*

A TABLE of Amplitudes, fitting all Places from the Equinoctial to 60 Degrees of Latitude, either North or South.

## The Degrees of Latitude.

Sun's Decl.	49	50	51	52	53	54
	D. M.	D. M.	D. M.	D. M.	D. M.	D. M.
0	00 00	00 00	00 00	00 00	00 00	00 00
1	01 31	01 33	01 35	01 37	01 39	01 41
2	03 03	03 06	03 10	03 15	03 20	03 24
3	05 34	04 40	04 46	04 52	04 59	05 06
4	06 06	06 14	06 22	06 30	06 39	06 49
5	07 38	07 48	07 58	08 08	08 19	08 31
6	09 10	09 21	09 33	09 46	10 00	10 15
7	10 42	10 55	11 09	11 24	11 40	11 57
8	12 14	12 29	12 45	13 02	13 21	13 41
9	13 47	14 05	14 24	14 43	15 04	15 26
10	15 21	15 40	16 01	16 23	16 46	17 11
11	16 54	17 16	17 39	18 03	18 29	18 57
12	18 28	18 52	19 18	19 44	20 12	20 43
13	20 03	20 29	20 57	21 26	21 57	22 30
14	21 38	22 06	22 37	23 08	23 42	24 18
15	23 14	23 45	24 18	24 52	25 28	26 07
16	24 51	25 24	25 59	26 36	27 16	27 59
17	26 28	27 03	27 41	28 21	29 04	29 50
18	28 06	28 43	29 24	30 07	30 53	31 42
19	29 45	30 25	31 08	31 55	32 45	33 38
20	31 25	32 08	32 54	33 46	34 39	35 35
21	33 06	33 52	34 41	35 34	36 31	37 24
22	34 48	35 37	36 30	37 27	38 29	39 36
23	36 33	37 26	38 23	39 24	40 29	41 40
24	37 26	38 20	39 19	40 23	41 32	42 45

Degrees of Declination.



# The Mariners Compass Rectified.

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A TABLE of Amplitudes, fitting all Places\* from the Equinoctial to 60 Degrees of Latitude, either North or South.

## The Degrees of Latitude.

Decl. Sun's	55	56	57	58	59	60
	D. M.	D. M.	D. M.	D. M.	D. M.	D. M.
0	00 00	00 00	00 00	00 00	00 00	00 00
1	01 45	01 47	01 50	01 53	01 56	02 00
2	03 29	03 34	03 40	03 46	03 53	04 00
3	05 14	05 22	05 31	05 40	05 50	06 00
4	06 59	07 10	07 22	07 34	07 47	08 01
5	08 44	08 57	09 11	09 26	09 43	10 02
6	10 30	10 47	11 04	11 22	11 42	12 04
7	12 15	12 35	12 56	13 18	13 41	14 06
8	14 02	14 24	14 48	15 14	15 41	16 10
9	15 49	16 14	16 41	17 10	17 41	18 14
10	17 37	18 05	18 35	19 07	19 41	20 18
11	19 26	19 57	20 29	21 04	21 43	22 26
12	21 15	21 49	22 25	23 04	23 47	24 34
13	23 05	23 43	24 23	25 07	25 54	26 45
14	24 56	25 37	26 21	27 09	28 01	28 56
15	26 49	27 34	28 22	29 14	30 10	31 10
16	28 43	29 32	30 24	31 21	32 22	33 27
17	30 39	31 31	32 27	33 28	34 32	35 47
18	32 35	33 33	34 34	35 40	36 52	38 10
19	34 35	35 36	36 43	37 54	39 13	40 37
20	36 36	37 42	38 53	40 12	41 37	43 10
21	38 39	39 51	41 09	42 34	44 05	45 47
22	40 47	42 04	43 27	44 59	46 40	48 32
23	42 56	44 19	45 50	47 30	49 21	51 24
23, 31	44 06	45 32	47 05	48 49	50 41	52 52

Degrees of Declination.

## The Use of this Table of AMPLITUDES.

THE *Amplitude*, is the Distance of Rising or Setting of the Sun or Stars from the *East* or *West* Points of the Horizon.

And *Note*, The Sun or Star having *North* Declination, they rise to the Northward of the *East*, and set to the Northward of the *West*: But if their Declination be *South*, they rise to the Southward of the *East*, and set to the Southward of the *West*: And by these Tables is thus found.

Look the Latitude in the Head of the Table, the Declination in the first Column on the Left-hand, and in the common Angle of Meeting is the *Amplitude* desir'd.

## Example 1.

In the Latitude of 30 d. the Sun's Declination being 7 d. 0 m. North, I demand the *Amplitude*?

*Ans.* The *Amplitude* is 8 d. 6 m. for under Latitude 30 d. and against Declination 7 d. you will find 8 d. 6 m. which is the *Amplitude* from the *East* Northward, at Sun-rising, or from the *West* Northward at Sun-setting. But if the Declination had been 7 d. 0 m. South, in Latitude 30 d. as aforesaid, then the *Amplitude* would have been 8 d. 6 m. from the *West* Southward at Sun-rising, and 8 d. 6 m. from the *West* Southward at Sun-setting.

If there be any odd Minutes of Declination, take the proportional Part.

*Examp. 2.* In the Lat. of 42 d. 30 m. the Sun's Declination being 12 d. 15 m. I demand the *Amplitude*?

*Ans.* The *Ampl.* is 16 d. 43 m. found as follows;  
According to the former Directions for the Lat. of 42 d. and Declin.  $\left\{ \begin{array}{l} 12 \\ 13 \end{array} \right\}$  d. the *Amplitude* is  $\left\{ \begin{array}{l} 16 \text{ d. } 16 \text{ m.} \\ 17 \text{ d. } 38 \text{ m.} \end{array} \right\}$   
being  $\left\{ \begin{array}{l} 12 \\ 13 \end{array} \right\}$  d. the *Amplitude* is  $\left\{ \begin{array}{l} 16 \text{ d. } 16 \text{ m.} \\ 17 \text{ d. } 38 \text{ m.} \end{array} \right\}$   
Subtract, and their Difference is ———— 1 d. 22 m.

Then

Then say; As 1 d. or 60 m. is to 1 d. 22 m. or 82 m.  
so is 55 m. to 20 m. found as here-under:

If 60 m. ————— 82 m. ————— 15 m.

15

410

82

6 (0) 122 (0) 20 m. proportional part.

030 Remainder.

Lat. 42 d. and Declin. 16 d. the Amplit. is 16 d. 16 m.

To it add proportional Part above ——— 0 d. 20 m.

Gives Amplit. for Declin. 12 d. 15 m. to be 16 d. 36 m.

D. M.

Again, for Lat. 43 d. and Dec.  $\left. \begin{matrix} 12 \\ 13 \end{matrix} \right\}$  d. Amp. is  $\left. \begin{matrix} 16 \cdot 30 \\ 17 \cdot 54 \end{matrix} \right\}$

Subtracted makes Difference to be ——— 1 · 24

Then say: As 60 m. is to 1 d. 24 m. or 84 m.

So is 15 m. to 21 m. found as here-under:

If 60 m. ————— 84 m. ————— 15 m.

15

420

84

6 (0) 126 (0) 21 m. proportional Parts.

06

00 Remainder.

Lat. 43 d. and Declin. 12 d. Amplitude is 16 d. 30 min.

To it add proportional Part above ——— 0 d. 21 min.

Gives for Declin. 12 d. 15 m. the Amplit. 16 d. 51 min.

Now because the given Latitude 42 d. 30 m. is in the middle, between 42 d. and 43 d. therefore the Medium of the Amplitudes before found, is the Amplitude required, and is thus:

K Lat.

Lat.  $\left. \begin{array}{l} 42 \\ 43 \end{array} \right\}$  d. Decl. 12 d. 15 m. the Amplitis  $\left\{ \begin{array}{l} 16. 36 \text{ m.} \\ 16. 51 \text{ m.} \end{array} \right.$

Added together, is  $\underline{\hspace{1.5cm}}$  33 d. 27 m.

The half is the Amplitude required  $\underline{\hspace{1.5cm}}$  16 d. 43 m.

Thus may the Amplitude be found for any odd Minutes of Latitude, or Declination, tho' the Table is Calculated for whole Degrees only.

By this Table the Variation of the Compass is most readily found; for by the *Azimuth Compass* find the Sun or Stars Magnetical Amplitude, at their Rising or Setting; and the true Amplitude (according to the Latitude of the Place, and their Declination) by this Table the Difference of these Amplitudes (when both are North, or both South) but their Sum (if one North, the other South) is the Variation.

But by the *Rectifier* it's most easily done thus.

Bring the Magnetical Amplitude (on the upper Compass) right against the true (on the lower) then doth the North Point in the upper stand against the Variation in the lower; and the upper Compass is explained in all it's Parts by the lower.

*Examp. 1.* Suppose the Magnetical Amplitude at Rising (found by the *Azimuth Compass*) be East Southerly 15 deg. 30 min. and the true Amplitude (according to the Latitude of the Place, and Declination of the Object observed be East Southerly 26 d. 45 m. I demand the Variation of the Compass?

By the RECTIFIER.

Bring 15 d. 30 m. East Southerly on the upper Compass, against 26 d. 45 m. East Southerly on the lower; then doth the North Point, on the first, stand right against 11 d. 15 m. North Easterly, on the latter; so that the Compass doth vary 11 d. 15 m. or one Point East.

*Examp. 2.*  $\left\{ \begin{array}{l} \text{True} \\ \text{Magnet} \end{array} \right\}$  Amplit.  $\left\{ \begin{array}{l} 07 \text{ d. } 00 \text{ m. East Northerly.} \\ 15 \text{ d. } 30 \text{ m. East Southerly.} \end{array} \right.$   
I demand the Variation of the Compass?

By



*By the RECTIFIER.*

Bring 15 d. 30 m. *East* Southerly on the upper Compass, against 7 d. *East* Northerly on the lower; then *North* on the first, stands against 22 d. 30 m. *North* Westerly; that is, 22 d. 30 m. or 2 Points Variation *West*.

In like manner do for any, and the Variation is most readily found.

## The Description and Use of Instruments most useful in Navigation.

### *The Use of the Fore-Staff or Cross-Staff.*

THE *Fore-staff*, so called from the Positure of the Observer in using it, whose Face is towards the Thing observed, generally; tho' for the Sun it's so contrived (for preserving the Eye) to be used backward: It's called a *Cross-staff* from it's Form, being a square Staff with 3 or 4 piece a cross it, which are all called *Crosses*.

The Staff is usually about 30 Inches or 3 Foot long, and more than half an Inch square, having 4 sides, each graduated unequally like a Scale of Tangents, to each of them belongs a distinct Cross; tho' sometimes the shortest Cross is made to serve two sides of the Staff; that is, the Breadth is for the Ten-Cross, and Length for the Thirty-Cross; Besides this, it hath two Crosses more, the longest is the Ninety-Cross, the other the Sixty-Cross; these four Crosses are thus to be understood: The

10	} Cross, belongs to that side beginning at	} 3 10 20 30	} and ending at	} 10 30 60 90
30				
60				
90				

K 2

The

*The Use of the Fore-Staff.*

**I**T's common and ordinary at Sea, to take the Meridian Altitude of the Sun or Stars with this Instrument, and by it find the Latitude they are in.

To perform which, take notice of these Precepts following:

1. Note, The 10, 30, 60 and 90 Crosses, are to be used according as the Meridian Altitude is more or less; that is, if less than 10 d. use the 10 Cross; if between 10 and 30 d. use the 30 Cross; if between 30 and 60 d. the 60 Cross; if more than 60 d. use the 90 Cross.

2. Having considered which Cross (according to the judged Altitude of the Object intended to be observed) is suitable put it on the Staff, so that the flat side of the Cross may be towards the flat end of the Staff: Then,

3. Hold the flat end of the Staff (as A) to the Corner  
of

of your Eye; there let it rest upon your Eye-bone, as near the Corner of your Eye as you can, so it doth not hinder your Sight.

4. Then look to the upper-end of the Cross, (as at C) for the *Sun*, and at the lower-end (at B.) for the *Horizon*.

5. But if, at the lower-end of the Cross, you see all Sky, and no Water, then draw the Cross a little nearer to your Eye.

6. If on the contrary, you see all Water and no Sky, then slide the Cross a little farther from you.

7. Then if you see the Center of the Sun at the upper-end of the Cross, and the Horizon at the lower-end, the Cross stands as it ought.

8. Wait till the Sun be on the Meridian, making Observation often: And as the Sun riseth, draw the Cross a little nearer to the Eye.

9. If the Sun be fallen, you will not see the Horizon, for the Water will hide it from you; and then observing is over at that Time: Stir not the Cross out of its place, only see at what Degree, *&c.* it resteth, on that side of the Staff belonging it; and its the Meridian Altitude or Complement thereof; according to the Word *Alt.* or *Compl.* on the Staff.

*How to use the FORESTAFF backward.*

**T**HIS is only used with the Sun, and for this purpose the Ten-Cross hath another piece of Wood or Ivory, put cross it; so that the lower-edge of this cross piece lieth even with the middle of the square Hole in the Ten-Cross; which also answers to the middle of the thickness of the Staff.

There is a Plate of Brass with a Hole in it, and so fitted, that it will slide off, and fit the Ends of the 90, 60, or 30 Crosses: These two things added to a *Fore-Staff*, make it fit for a backward Observation of the Sun; which is thus:

1. According as the Merid. Alt. of the Sun is more or less, so use the 90, 60, or 30 Cross; putting it on the Staff, the flat end of it even with the flat end of the Staff there screw it fast; and at one end of the Cross, slip on the aforesaid Brass Plate, so as to leave a slit sight through it, near the lower end of the Cross.
2. Put the Ten-Cross (having a cross piece on it) on the Staff, the flat side of it toward the other Cross, at the Staffs end.
3. Turn your back to the Sun; Look through the slit-sight, at the lower end of the Cross, for the shadow of the upper end of it, lying on the Ten-Cross, in the Line answering the middle of the Staff, and on each side of the Staff.
4. At the same Time, the Horizon should be seen (through the aforesaid slit) to lie even with the shadow on the middle Line, in the Ten-Cross, at each end of it, on both sides the Cross.
5. In looking through the slit-sight, you see the shadow on the middle Line; but instead of the Horizon you see only Water there; then draw the Ten-Cross nearer, till the shadow or Horizon agree or meet in the said middle Line.
6. On the contrary, looking as before, instead of the Horizon, you see Sky meet the shadow, on the middle Line; then put the Ten-Cross from you, till you see the Horizon and shadow meet at the Line.
7. Continue observing till the Sun be at the highest; and as the Sun riseth, you must draw the Ten-Cross nearer, in order to keep the Horizon and shadow together on the middle Line of it.
8. If the Sun be fallen (after you have continued observing as before directed) the Horizon will lie below the shadow, on the middle Line; then is the observing finished at that time: stir not the Ten-Cross out of its place; for where it now stands, on that side of the Staff belong-



belonging to the Cross, at the end of it is the Sun's Meridional Altitude, or Complement thereof, as before in observing forward.

Thus I have shewed how to take an Observation by the Cross-staff, and that both forward and backward. The next thing in Course will be to shew how to work it; and for that, take Notice of these following Rules.

*To Work an Observation.*

1. IF the Sun or Star hath North Declination, and be on the Meridian to the Southwards of you, subtract the Declination from the Meridian Altitude; the Remainder is the height of the Equinoctial, or Complement of the Latitude North.
2. But if the Object observed hath South Declination, add; the Sum (if it exceed not 90d.) is the height of the Equator, or Complement of the Latitude North: If it doth, subtract 90d. from it; the Remainder is the Latitude South.
3. If the Object hath North Declination, and be on the Meridian to the Northwards, add the Declination to the Meridian Altitude; the Sum (if it exceed not 90d.) is the height of the Equator, or Complement of the Latitude South: But if it doth exceed 90 d. subtract 90 d. from the said Sum, the Remainder is the Latitude North.
4. If the Sun hath South Declination, and be to the Northwards at Noon, subtract the Declination from his Meridian Altitude, the Remainder is the Complement of the Latitude South.
5. When the Sun hath no Declination, the Meridian Altitude is the Complement of the North Latitude; if South, at Noon; and the contrary.
6. If the Sun be in the Zenith, and at the same time he hath no Declination, you are under the Equinoctial.
7. But if the Sun hath North or South Declination, and in the Zenith; the Declination is the Latitude you are in, North and South.

8. If you observe Sun or Star upon the Meridian, beneath the Pole, add the Meridian Altitude, to the Complement of the Sun or Star's Declination; the Sum is the height of the Pole, or Latitude of the Place.

These eight Rules are Explained by the Examples following.

*Examples for Working an Observation in North Latitude.*

*Example 1.*

**A**dmit at Sea, I observe the Sun's Meridian Altitude to be 42 d. 20 m. South; and at the same Time the Sun's Declination is 10 d. 10 m. North, I demand the Latitude I am in?

	d.	m.
The Meridian Altitude	42	20 South.
The Declination	subt. 10	10 North.
The Complement of the Latitude	32	10
Subtract it from	90	00
The Latitude I am in, is	57	50 North.

*Examp. 2.* Being at Sea the 22d of May, Anno 1716. I find the Sun's Meridian Altitude to be 65 d. 10 m. South, I demand the Latitude?

	d.	m.
The Meridian Altitude	65	10 South.
The Declination	subt. 22	10 North.
The Complement of the Latitude	42	55
Subtract it from	90	00

The Latitude I am in, is 47 . 05 North.

*Examp. 3.* At Sea the 27th day of Novemb. An. 1716. I find the Sun's Meridian Altitude to be 26 deg. 30 m. South; I demand the Latitude I am in?

d. m.

	d.	m.
The Meridian Altitude	26	30 South.
The Declination	add 22	44 South.
The Complement of the Latitude	49	14
Subtract it from	90	00
The Latitude I am in, is	40	46 North.

*Examp. 4.* At Sea the 25th of April, Anno 1716. I find the Sun's Meridian Altitude, by observation, to be 58 d. 45 m. South; I demand the Latitude I am in?

	d.	m.
The Meridian Altitude	85	45 South.
The Declination	subt. 16	31 North.
The Complement of the Latitude	69	14
Subtract it from	90	00
The Latitude I am in, is	20	46 North.

*Examp. 5.* Admit the 12th Day of June, 1716, I find the Sun's Meridian Attitude, by observation, to be 80 d. 35 m. North; I demand the Latitude I am in?

	d.	m.
The Meridian Altitude	80	35 North.
The Declination	add 23	31 North.
The Sum (exceeds 90 deg.)	104	06
From it subtract	90	00
The Latitude I am in, is	14	06 North

*Examp. 6.* Admit, August 22, 1713. The Sun's Meridian Altitude was observed to be 85 d. 15 m. North; I demand the Latitude of that Place?

	d.	m.
The Meridian Altitude	85	15 North.
The Declination	add 08	1 m North.
Sum (exceeds 90 deg.)	93	32
Therefore from it subtract	90	00
The Latitude of that Place is	03	32 North.

*Examp.*

*Examp. 7.* Admit in a Ship at Sea, June 29, 1720,  
The Sun's Meridian Altitude was 66 d. 45 m. North;  
I demand the Latitude the Ship is in?

The Meridian Altitude	66 . 45 North.
The Declination	add 23 . 15 South.
Complement of the Latitude	90 . 00
Subtract it from	90 . 00
The Ship is under the Equinoctial	00 . 00

*Examples to find the Latitude, by observing the Stars.*

*Example 1.*

Admit, I observe the Bull's Eye upon the Meridian,  
and find his Meridian Altitude to be 50 d. 30 m.  
South; I demand the Latitude I am?

The Declination of this Star, the Bull's Eye, is	d. m. 15 . 46 North.
The Meridian Altitude of the Star	50 . 30 South.
The Declination	subt. 15 . 46 North.
Complement of the Latitude, is	34 . 44
Subtract it from	90 . 00
The Latitude I am in, is	55 . 16 North.

*Examp. 2.* Admit I observe the bright Star in the  
Great Dog's Mouth, and I find his Meridian Altitude to be  
35 d. 45 m. South; I demand the Latitude I am in?

The Declination of the Great Dog's Star, is	d. m. 16 . 15 South.
The Meridian Altitude of the Star	35 . 45 South.
The Declination	add 16 . 15 South.
The height of the Equator, is	52 . 00
Subtract it from	90 . 00
The Latitude I am in, is	38 . 00 North.

*Example*



Examples for working an Observation in South Latitude.

Example 1.

Admit, the 10 Day of May, Anno 1716. I find the Sun's Meridian Altitude, by observation, to be 62 d. 00 m. North; I demand the Latitude the Ship is in?

The Meridirm Altitude	_____	62 . 00 North.
The Declination	_____	add 20 . 08 North
The Complment of the Latitude is	_____	82 . 08
subtract it from	_____	00 . 00
Latitude the Ship is in, is	_____	07 . 52 South.

Example 2.

Admit, the 15th Day of January, Anno 1718, in Longitude 150 d. East, I find the Meridian Altitude, by Observation, to be 58 d. 45 m. North; I demand the Latitude the Ship is in?

The Declination in the Merid. of London, for the 15th of Jan. 18 d. 57 m. the daily difference at the this Time is 15 m. decreasing; therefore (in the Table of Proportion) you will find the proportional Minutes to be 6 m. which add to the Declination in the Meridian of London, the Sum is 19 d. 3 m. South; the true Declination for the Longitude of 150 d. East

The Meridian Altitude	_____	58 d. 45 m. N.
The Declination	_____	subt. 19 d. 03 m. S.
Complement of the Latitude, is	_____	39 . 42
Subtract it from	_____	90 . 00
Latitude the Ship is in, is	_____	50 . 18 South

Example

*Example 3.*

Admit the 12<sup>th</sup> day of July, Anno 1716. I find the Sun's Meridian Altitude to be 66 d. 52 m. North; I demand the Latitude?

	d.	m.
The Meridian Altitude	66	52 North.
The Declination	add 20	14 North.
Complement of the Latitude, is	87	06
Subtract it from	90	00
The Latitude required	02	54 South.

*Example 4.*

A Ship at Sea, the Sun's Declination being 15 d. 30 m. South, and the Sun's Meridian Altitude 80 d. 45 m. South; I demand the Latitude the Ship is in?

*Answ.* 6 d. 15 m. South.

*Example 5.*

The Sun's Declination being 11 d. 14 m. South; and his Meridian Altitude 79 d. 38 m. South; I demand the Latitude?

*Answ.* The Latitude is 0 d. 52 m. South.

*Note, 1.* If you observe by the lower part of the Sun, you must add 16 m. for the Sun's Semidiameter, and the Sum will be the true Altitude of the Sun's Center.

*Note, 2.* If you observe by the upper Limb of the Sun, subtract 16 m. the Remainder, is the Altitude of the Sun's Center.

The

The Figure of the

# QUADRANT.



The

*The Description and Use of the QUADRANT.*

**T**HIS Instrument, called a *Quadrant*, first invented by our Country-man Capt. Davis, and thence call'd *Davis's Quadrant*, is of a very commodious Form; at present, the most general approv'd Instrument at Sea, for observing the Sun's Meridian Altitude.

The Form of it (as in the Figure prefix'd) may be of any Radius, or Length between 18 Inches and 3 Feet; but the most general now made, are *QUADRANTS* of 26 Inches Radius, with one Arch 65 Degrees, the other 25, and a *Glass* in the *Shaddow-Vane*.

The principle Parts are 3 Vanes and 2 Arches; on which Arches the Degrees both together make 90; from whence it hath the Denomination of a Quadrant.

The *Horizon-Vane* (mark'd in the foregoing Figure A B. and with it's name respects the Horizon in Time of observing; that which gives the Shadow, is nam'd the *Shadow-Vane*: and thro' which you are to look for both Shadow and Horizon, is term'd the *Sight-Vane*: And all these are noted in the Figure by their Names.

*Of the Two Arches,*

The lesser noted D E, is called the 60th Arch, because it did heretofore contain no more, and is so numbred in the Figure; but now it often contains 65, and sometimes 70 Degrees: This Arch is of a small Radius, being so design'd, that the *Shadow-Vane* used on it, being at so small a distance from the *Horizon-Vane*, on which it's Shadow (in time of observing) is to fall, might be more visible to the Eye of the Observer.

This little Arch is divided sometimes but to every five Degrees, and never less than every single Degree; it's numbred from the upper-end D, with 5, 10, 15, 20, &c. downwards to E, where it ends in the Line A E F  
(a Line



(a Line in the middle of the longer Leg of the *Quadrant*) at 60, 65, or 70 Degrees, according as the other Arch is divided; so that the Numbers at E and F together, ever must make 90 Degrees.

The greater Arch CF, is call'd the 30th Arch; it's of a large Radius, that it might contain the lesser Subdivisions of a Degree; and being of a competent Breadth, thereon are usually describ'd 10 *Concentrick Circles*, intersected with 3 Diagonal Lines in each Degree, making each Intersection 2 m.

This great Arch is divided on the Limb into Degrees by long Stroaks, each again subdivided into 6 equal parts by shorter Stroaks, each small Division being 10 Minutes, and are numbred from the lower-end C, with 5, 10, 15, &c. upward to F, where it ends in the Line AEF at 20, 25, or 30 Degrees: The Figures at F and E together make 90; and in the Figure are 30 and 60.

### *The Use of the QUADRANT.*

THIS Instrument is rarely us'd otherwise than to observe the Sun's Meridian Altitude; which to perform, I thus describe.

1. Put the *Horizon-Vane* AB on the End A, and home to the Center A; the *Sight-Vane*, put on the Arch CF, close to the Back of it; the *Shadow-Vane* on the little Arch DE, home to the Back of it, and the upper-edge of the *Vane* set to a Number of Degrees, less than the Complement of the Altitude by 15 or 20 Degrees.

2. The *Vanes* being thus fix'd upon the *Quadrant*, turning your Back towards the Sun, the End C in your Hand, and F uppermost, look through the *Sight-Vane*, causing the upper-edge of the shade of the *Shadow-Vane*, to lie upon the upper-edge of the Slit in the *Horizon-Vane*, where is drawn a Black Line at the same time, if the *Horizon* appear thro' the said Slit in the *Horizon-Vane*, the *Vanes* on the *Quadrant* stand at the Sun's present Altitude.

↓

3. But

3. But if the Sky appear instead of the Horizon, slide the *Sight-Vane* a little higher towards F: On the contrary, if the Sea appear instead of the Horizon, then slide the *Sight-Vane* lower towards C; continue so to do, till the Horizon appear thro' the *Horizon-Vane*.

4. In order to obtain the Meridian Altitude (which is the greatest the Sun will have that Day, and the Thing us'd to find the Latitude) continue observing; and as the Sun rises, the Sea will appear thro' the *Horizon-Vane*; and the *Sight-Vane* must be slid lower accordingly; Thus do, observing as often as may be convenient, till the Sun is at the highest.

5. When the Sun begins to fall, the Sky will appear (thro' the *Horizon-Vane*) instead of the Horizon; then desist observing for that Day.

6. Having thus done, add the Degrees the upper edge of the Vane standeth at to the Degrees and Minutes cut by the inside of the *Sight-Vane*, their Sum is the Complement of the Sun's Meridian Altitude, or the Distance of the upper-edge of the Sun from the Zenith; to which Sum add 16 m. the Sun's Semidiameter; and this last Sum is the Distance of the Sun's Center from the Zenith, being the true Complement of the Sun's Meridian Altitude.

Note, The upper-edge of the shade of the *Shadow-Vane* respects the upper Limb of the Sun; and the lower-edge of the said shade, answers to the lower Limb of the Sun; so that observing by the first, you are to add 16 m. to, or from what's on the *Quadrant*; the Sum or Difference, is the Distance of the Sun's Center from the Zenith, call'd his *Zenith Distance*, or Complement of his *Meridian Altitude*.

Thus I have shew'd how to take an Observation with the *Quadrant*, I come now to shew how to work it. The difference in working an Observation taken by the *Fore-staff* and the *Quadrant*, is only this: By the *Fore-staff* you take

take the Altitude, by the *Quadrant* the Complement of the Altitude, or the Distance of the Sun from the Zenith: Altitude is the Distance of the Sun from the Horizon; therefore if you subtract the Complement of the Altitude from 90 d. the Remainder is the Altitude, which you may use as in the Use of the *Fore-Staff*.

But it is usual to work Observations (made by the *Quadrant*) by the Complement of the Sun's Meridian Altitude; I will therefore give some general Rules, and some particular Examples for their Explanation.

*The General RULES are,*

1. **I**F the Sun hath *North* Declination, and upon the Meridian to the Southwards of the Observer, add the Sun's Declination to the Zenith Distance or Complement of the Sun's Meridian Altitude the Sum is the Latitude you are in, *North*.

2. If the Sun be to the Southward of you, and hath *South* Declination, subtract the Sun's Declination from the Zenith Distance, the Remainder will be the Latitude you are in, *North*: But if the Declination exceed the Zenith Distance, subtract the lesser from the greater, and the Remainder is the Latitude *South*.

3. If the Sun be to the Northward of you, and hath *South* Declination; add the Sun's Declination to his Zenith Distance, the Sum will be the Latitude *South*.

4. If the the Sun be to the Northward of you, and hath *North* Declination, subtract the Sun's Declination from his Zenith Distance, the Remainder will be the Latitude *South*: But if the Declination exceed the Zenith Distance, subtract the lesser from the greater, and it gives the Latitude *North*.

I might have been larger in giving more general Rules; but if you understand those 8 Rules for the Use of the *Fore-Staff*, you cannot err in these, using the *Quadrant*: And for their Explanation, the Examples follow.



*The Rules explained by Examples of observing in North Latitude.**Example 1.*

ON the 10th of *April* 1717, the Sun came to the Meridian in the *South*; and, by Observation, found his Zenith Distance, or Complement of his Meridian Altitude, to be 34 d. 47 m. that is, his upper Limb was so much from the Zenith; I demand the Latitude of the Place of Observation.

	d.	m.
Complement of the Meridian Altitude	—34 .	47 <i>South</i> .
The Sun's Semidiameter	—add 00 .	16
Dist. of the Sun's Center from the Zenith	35 .	03 <i>South</i> .
Declination <i>North</i>	—add 11 .	55 <i>North</i> .
Latitude of the Place required	—46 .	58 <i>North</i> .

*Example 2.*

The 14th Day of *August*, *Anno*. 1717, I find the Complement of the Sun's Meridian Altitude, by Observation, to be 28 d. 48 m. *South*; I demand the Latitude the Ship is in?

	d.	m.
Complement of the Meridian Altitude	—28 .	48 <i>South</i>
Sun's Semidiameter	—add 00 .	16
Dist. of the Sun's Center from Zenith	—29 .	04 <i>South</i> .
The Declination	—add 10 .	52 <i>North</i> .
Latitude the Ship is in, is	—39 .	56 <i>North</i> .

*Example 3.*

*September* 13, 1717. I find the Complement of the Sun's Meridian Altitude, by Observation, to be 47 d. 35 m. *South*; I demand the Latitude I am in?

Com-



	d.	m.	
Complement Meridian Altitude	47	35	South.
Sun's Semidiameter	add 00	16	
Distance of the Sun's Center from Zenith	47	51	South.
The Declination	subt. 00	13	South.
Latitude the Ship is in	47	38	North.

*Example 4.*

The 15th day of November, An. 1717, I find the Complement of the Sun's Meridian Altitude, by Observation to be 52 d. 0 m. South; I demand the Lat. the Ship is in?

	d.	m.	
Complement of the Meridian Altitude	52	00	South
Sun's Semidiameter	add 00	16	
Distance of the Sun's Center from Zenith	52	16	South.
The Declination	sub. 18	45	South.
Latitude the Ship is in	33	31	North.

*Example 5.*

The 27th of May 1718, the Sun to the Northward of me; and the Complement of the Meridian Altitude by Observation. to be 10 d. 15 m. I demand the Latitude the Ship is in?

	d.	m.	
Sun's Declination	22	49	North.
Complement of Meridian Altitude	10	15	
The Sun's Semidiameter	add 00	16	
The true Zenith Distance	subt. 10	31	North.
Latitude the Ship is in	12	18	North.

*Example 6.*

Admit the 29th of Day June, Anno 1718, The Sun upon the Meridian, I find by Observation, the upper Limb of the Sun is 6 d. 42 m. to the Northward of my Zenith; I demand the Latitude I am in?

	d.	m.
Sun's Declination	22	26 North.
Sun's Semidiameter	add 00	16
Sun's supreme Marg. dist. from Zentih	06	42
Dist. of Sun's Center from Zenith	subt. 06	58 North.
Latitude the Ship is in	15	28 North.

*Example 7.*

The 21<sup>st</sup> of July, *An.* 1718, in Longitude 165 d. *West*, and the Sun being upon the Meridian, I find by Observation, the supreme Margin of the Sun is 16 d. 45 m. to the Northward of my Zenith; I demand the Latitude the Ship is in?

	d.	m.
The Declination	18	15 North.
Proportional Minutes	subt. 00	06
Sun's Declination in the Meridian given	18	09 North.
Sun's supreme Margin. dist. from Zenith	16	45 North.
Sun's Semidiameter	add 00	16
Sun's Center distant from Zenith	17	01 North.
Latitude the Ship is in	01	08 North.

*The Rules explain'd by Examples of Observation in South Lat.*

*Example 1.*

THE 15<sup>th</sup> Day of July, *An.* 1718, in Longitude 150 d. *East*, and the Sun being upon the Meridian, I find the Complement of his Meridian Altitude, by Observation, to be 48 d. 28 m. *North*; I demand the Lat. the Ship is in?

	d.	m.
Complement of the Meridian Altitude	48	28 North.
Sun's Semidiameter	add 00	16
Sun's Center distant from the Zenith	48	44 North.
The Declination	subt. 19	47 North.
Latitude the Ship is in	28	57 South.

*Examp.*

*Examp. 2.*

The 29th of *October, An. 1718*, in Longitude 120 d. *West*, and the Complement of the Sun's Meridian Altitude, by Observation, is 27 d. 29 m. *North*; I demand the Latitude the Ship is in?

	d.	m.
Complement of Meridian Altitude	27	29 North
Sun's Semidiameter	add 00	16 South
Sun's Center from the Zenith	27	45 North
The Declination	add 15	46 South.
Latitude the Ship is in	43	31 South.

*Example 3.*

Admit the 25th of *December, Anno 1718*, I find the Sun upon the *South* part of the Meridian, and, by Observation, the Complement of the Sun's Meridian Altitude 15 d. 10 m. I demand the Latitude the Ship is in?

	d.	m.
Complement of the Meridian Altitude	15	10 South.
Sun's Semidiameter	add 00	16
Sun's Center from the Zenith	subtr. 15	26 South.
The Declination	22	45 South.
Latitude the Ship is in	07	19 South.

Thus much I thought necessary to add by way of Explanation of the fore-going Rules, which shew a perfect Way of Observing; that is, how to take and Work an Observation with more Exactness than hath been formerly us'd.

*Note 1.* The Sun's Semidiameter, here added to the Complement of its Meridian Altitude, may be contriv'd so on the *Quadrant*, that its Addition by the Pen may be omitted; for this purpose the *Quadrants* made by *James Atkinson* at *Cherry-Garden-Stairs* on *Rotherhithe-Wall*, have

on the back-edge of the little Arch, (every 5 d. numbred, differing from those on its flat side, the Semidiameter of the Sun: So that placing the upper-edge of the *Shadow-Vane* to the Degree on the foresaid back-edge of the Arch, the *Quadrant* then sheweth the true Complement of the Altitude, or the Distance of the Sun's Center from the Zenith; which prevents adding 16 m. after observing.

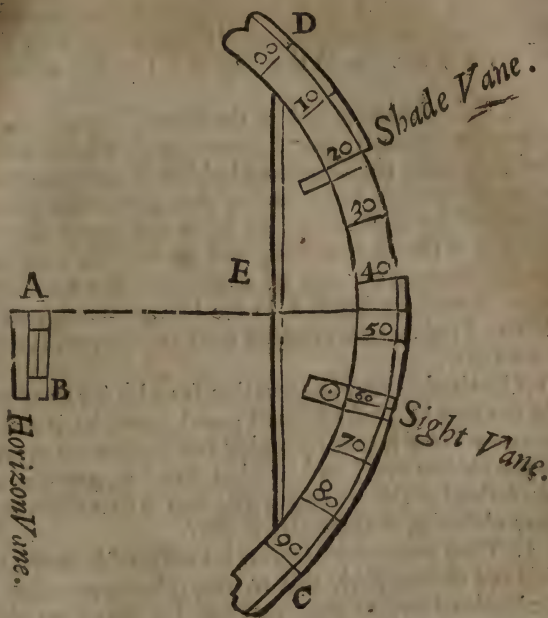
2. There is another Contrivance of late, which is putting a Convex-Glass in the middle of the Edge of the *Shadow-Vane*; which Glass in time of observing, is to cast an illuminated Spot on a round black Spot made in the *Horizon-Vane*: This is useful when the edge of the shade of the *Shadow-Vane* is not very conspicuous; that being discernable when the latter is not. The manner is thus:

Set that part of the *Shadow-Vane* which is right against the middle, or Center of the Glass, to the Degrees, on the little Arch; and then cause the enlightened Spot of the Glass to lie on a black Spot or Circle on the *Horizon-Vane*; at the same time look for the Horizon through it, as before directed; so will you have (observing by this Glass in the *Vane*) the true Complement of the Sun's Altitude, or the Distance of his Center from the Zenith.

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The Figure of the B O W.



The Description and Use of the B O W.

1. THIS Instrument consisteth of two Parts, (making the Figure ACD) besides the 3 Vanes which are the same for kind with those us'd with the Quadrant. The Parts are the Arch CD, and the Radius AE; this latter slips in a Socket, so as to be taken out, for convenience, to lie in a little room.

L 4

3. The

2. The 3 Vanes are the same as before describ'd in the *Quadrant*, and their Names are inserted in the Figure of the Bow prefix'd.

3. The Degrees are numbred from the upper-end of the Arch D, downwards towards the lower-end C, thus, 5, 10, 15, &c. as in the Figure: The Use of it follows:

1. Take the lower-end of the Bow C in your Hand, (after the Vanes are plac'd according to the Directions before in using the *Quadrant*) holding it upright; look through the *Sight-Vane*, causing the upper-edge of the Shade of the *Shadow-Vane*, to lie on the upper-edge of the Slit of the *Horizon-Vane*; and at the same time look for the Horizon through it, sliding the *Sight-Vane* higher or lower, (as directed in the Use of the *Quadrant*) till the Shadow and Horizon meet together on the *Horizon-Vane*.

2. Continuing your Observation (as with the *Quadrant*) till the Sun be at the highest; and when he is fallen, you may know it thus: Keeping the Shadow on the Slit of the *Horizon-Vane*, and looking thro' it, you see the Sky instead of the Horizon; the Sun is then fallen, and your observing for that Day is over.

3. Then count the Degrees intercepted between the *Sight* and *Shadow-Vane*, that is, from the upper-edge of the *Shadow-Vane*, to that part of the *Sight-Vane* right against the middle of the Eye-hole in it, they shew the Sun's Altitude: Or thus, subtract the Degrees at the *Shadow-Vane*, from those (at the sight) of the *Sight-Vane*, the Remainder is the Sun's Altitude or Distance of this upper Limb from the Horizon; from which subtract 16 Minutes, so have you the Altitude of his Center: But if the *Shadow-Vane* have a Glass in it, and the Observation be made by it (as before directed, in its using with a *Quadrant*) the Instrument sheweth the true Altitude, without the Subtraction of 16 Minutes for the Sun's Semidiameter.

*To find the Latitude in Observing by the B O W.*

The same Rules given in observing by the *Forestaff*, are to be follow'd here, or subtract what the *Bow* sheweth from 90 d. and then the Rules for the *Quadrant* are to be observ'd, in order to find the Latitude.

*The Description and Use of the NOCTURNAL.*

1. **T**HE Nocturnal consists of 3 Parts; the first, term'd the unmovable Part, is the broadest and greatest, to which is a Handle to hold it by in time of Observation.

On the fore-side of which, in the uttermost Circle, are the 12 Months, and each Month divided into its respective Days, or at least every two Days: They are counted towards the Right-hand, mark'd with their Names, or the first 3 Letters thereof; as *Jan.* for *January*, *Feb.* for *February*, *Mar.* for *March*, &c. Within the Circle of Months, is a Circle divided into 24 equal Parts or Hours, each Hour divided into Halfs or Quarters, us'd to find the time of *Full-Sea* or *High-Water*.

On the back-side of this Part are the 32 Points of the Compass, *South* uppermost, and *East* on the Left-hand; to each Point is set the Declination of the *North-Star* above or under the Pole, which is known by *Und.* for *Under*, and *Ab.* for *Above*.

There have formerly been made two sorts of Nocturnals, one for the *Great Bear*, the other for the *Little Bear*: Those made for the Guards of the *Great Bear*, or *Charles's Wain*, commonly called the 2 *Pointers*, have *February* at the top; but those made for the Guards of the *Little Bear*, have *April*: But they are now made for both *Bears* in one Nocturnal; and are known by having either 2 Circles of Months, mark'd *GB.* and *LB.* or 2 short Teeth or Indexes, proceeding from the second or middle Part of it.

2. The

2. The second moveable middle-part, hath 2 Circles on it; the outermost is divided into the 29 Days and  $\frac{1}{2}$  of the Moon's Age; the innermost into 24 equal Parts, or Hours, each Hour subdivided into Halfs and Quarters; this part hath a Tooth, or short Index, proceeding from it, with the Edge continu'd in a right Line from the Center; which is to be set to the Day of the Month when us'd: Some have 2, mark'd G on one, and L on t'other; G standing for *Great Bear*, and L for *Little Bear*; signifying the Nocturnal is made for both Bears, and may be used for either.

3. The third and moveable Part, is call'd the *Index*, its uppermost on the foreside of the Instrument, having one Edge proceeding in a right Line from the Center, (which in time of Observation) must be turn'd to the Guards: Thro' all 3 pieces, in the Center of the Instrument is a Hole, thro' which you are to see the *North-Star*, when the *Index* is turn'd to the Guards.

*The Use of the NOCTURNAL.*

BY it may be found the Hour of the Night, the Bearing of the Guards, and the Declination of the *North-Star* from the Pole, by which may be found the Latitude, as shall be shewn in order.

I. *To find the Hour of the Night.*

1. Place the the *Index* of the second or middle Piece, to the Day of the Month, where it's to be kept till the Observation is ended: Then taking the Handle in your Hand, with the foreside towards you.

2. And holding it upright (which you may discern when you do so, by the tip on the top of the first or great Part of the Nocturnal) look thro' the Hole in the Center for the *North-Star*.

3. Turn that edge of the long *Index*, which proceedeth from the Center to the Guards, seeing at the same time the *North-Star* thro' that Hole: Then will the *Index* shew the Hour of the Night, on the second or middle Part.

The



# The Figure of the Nocturnal.



2. To find the Bearing of the Guards either of the Little or Great Bear; that is, upon what Point of the Compass they are.

1. Having observ'd all the particular Directions, as before, in finding the Hour of the Night, you see the North-Star through the Hole, and the Guards by the edge of the long Index.

2. Then look on the back-side of the Nocturnal, what Point of the Compass standeth against the foresaid edge of the Index; which is the Bearing of the Guards; and at the said Point of the Compass is figur'd the North-Star's Declination from the Pole, at that time either above or under.

Examp. 1. The 20th of December, at 6 of the Clock in the Morning, observing the Pointers, or Guards of the Great Bear, by the edge of the Index; I demand their Bearing, and Declination of the North Star?

Right against the edge of the Index (you observe with) and on the back-side of the Nocturnal is S. W. by S. the Point of the Compass requir'd: And on the said Point of the Compass is 2 d. 33 m. und. signifying the North-Star is then 2 d. 33 m. under the Pole.

Examp. 2. The 14th of February, I observe (according to the Directions before given) at 7 a Clock in the Evening, the Guards of the Little Bear by the edge of the long Index; I demand their Bearing, and the Declination of the North Star?

Seeing the North-Star thro' the Hole in the middle, and the Guards of the Little Bear, by the edge of the long Index (note that edge respecting the Center of the Instrument and the Index cutting 7 of the Clock in the middle-part; then on the back-side of the Nocturnal, and against the said edge of the Index, is N. E. the Point of their Bearing; and on the said Point is figur'd 0.35 Abo. which signifieth the North-Star is then 35 Minutes above the Pole.

3. To find the Moon's Southing by the Nocturnal

To do this, look for the Moon's Age in the outermost Circle, on the middle or second piece of the Nocturnal; and right against it, in the innermost Circle of the same Piece, is the Southing.

Example. If the Moon be 19 Days old; I demand her Southing?

Right against 19, in the outermost Circle, is  $3\frac{1}{2}$  in the innermost Circle; which is half an Hour past 3 of the Clock in the Morning, the Time of the Moon's coming to the South.

4. To find the Time of Full-Sea by the Nocturnal.

1. Set the short Index of the middle-part (if it have 2 Indexes, that which stands at 12) to the time of Full-Sea, on the new or Full-Moon (for the place propos'd) in the innermost Circle of the great piece.

2. Keeping that there, bring the long Index to the (Southing, or) Moon's Age on the middle Piece.

3. Then right against the long Index, and in the innermost Circle on the great Piece, in the time of Full-Sea requir'd.

Example, The Moon being 19 Days old; I demand the Time of Full-Sea at Gravesend?

1. Bring the Index or Tooth of the middle-part which stands at 12 to  $1\frac{1}{2}$  Hour, which is N. N. E. and S. S. W. the Point of the Compass making Full-Sea at Gravesend on the New, or Full-Moon, in the innermost Circle of 24 Hours on the great Piece; keeping that fast there.

2. Turn the long Index to 19 Days, the Moon's Age, (or to  $3\frac{1}{2}$  Hours, the Moon's Southing) on the middle Piece.

3. Then right against the long Index, and in the innermost Circle on the great Piece, is 5 Hours; the time of Full-Sea, or High-water, in the Morning at Gravesend.

5. To



5. To find the Latitude of any Place by the Nocturnal, and Fore-Staff.

1. find the North-Star's Declination from the Pole by observing with the Nocturnal, as directed in Example 1, and 2, of the 2d Use.

2. Then (at the same time) with a Fore-staff take the Altitude of the North-Star.

3. If the North-Star be above the Pole, subtract it's Declination from; if under, add to it's Altitude; the Sum or Difference, is the Latitude requir'd.

Example 1. Suppose the 14th of February, at 7 of the Clock in the Evening, observing with the Nocturnal, you find the Guards of the Little Bear to bear N. E. which is 0 d. 35 m. above the Pole; and at the same time by the Forestaff, find the Altitude of the North-Star 42 d. 10 m. I demand the Latitude of the Place?

From the Altitude of the North Star	—42 10
Subtract it's Declination above	—00 35

Remainder is the Latitude required 41 35 North:

Example 2. The 20th of December, at 6 of the Clock in the Morning, observing with the Nocturnal, I find the Guards or Pointers of the Great Bear S. W. by S. which is 2 d. 33 m. under the Pole; and at the same time, by the Fore-staff, find the Altitude of the North Star 45 d. 22 m. I demand the Latitude of the Place of Observation?

To the Altitude of the North Star	—45 22
Add it's Declin. from the Pole under	—02 33
Sum is the Latitude requir'd	—47 55 North.

### The Description and Use of Gunters's S C A L E.

THIS Instrument, for its quick and easy dispatch of the most common and useful Proportions, deserves



as generally to be known in it's Uses, as by it's Name: On that account, I'll touch a little on it's Description, before I give you a tast of it's manifold Uses: as brief and plain as I can.

1. *Gunter's Scale* (so called from Mr. *Gunter* it's first Contriver) is usually made of Box-wood, of any Length and Breadth (but commonly 2 feet long, and  $1\frac{1}{2}$  Inch broad) on which are the Lines or Scales of Numbers, Sines, Tangents, &c. Of which are 2 sorts, the long or *sliding Gunter*, and the *sliding Gunter*; on both sorts are the same Lines, though differently used; the first with Compasses, the latter by sliding.

2. The Lines (most usual now) set on *Gunters* are 8, and have their Names at the right-hand end thereof, under oneanother thus; *Sine Rumb*, *Tang-Rumb*, *Numbers*, *Sines*, *Versed Sines*, *Tangents*, *Meridian* (for Meridional Parts) and *Equal Parts*.

3. The *Sine-Rumb*, and *Tang-Rumb*, are both Points of the Mariners Compass; the first is figured from the left hand towards the right, with 1, 2, 3, 4, 5, 6, 7, and 8, at which is a Brass Center-pin; the latter is figur'd thus, 1, 2, 3, and 4, at the said Center-pin, and thence back again towards the left hand with 5, 6. and 7; each Point in both Lines, (where it can) is subdivided into Halfs and Quarters; these 2 Lines are chiefly useful in Navigation.

4 The next under *Tang-Rumb*, is the *Line of Numbers* figur'd thus; near the left-hand end, it begins at 1, and towards the right-hand, 2, 3, 4, 5, 6, 7, 8, 9; then 1 in the middle, at which is a Brass Center-pin; going still on 2, 3, 4, 5, 6, 7, 8, 9, and 10, at the end, where is another Center-pin: This Line is of the most general Use, and requires the larger Account of it: Wherefore take these following Notes for the *Line of Numbers*.

Note 1. All the Figures on this Line may be taken single as they stand; or be increased, or diminish'd at pleasure  
so

*So it be in decuple Proportion:* That is, the first 1 may be counted for 1, or 10, or 100, or 1000, &c. then the next 2 is accordingly 2 or 20, or 200, or 2000, &c. Again, the first 1 may be reckon'd 1 tenth, or 1 hundredth, or 1 thousandth Part, &c. then the next 2 is 2 tenths, or 2 hundredths, 2 thousand Parts, &c. So that,

If the first 1 be taken for 1, the middle 1, is then 10, and 2 to its Right-hand is 20, 3 is 30, 4 is 40, and 10 at the end, is now 100: Again, if the first 1 be counted 10, the next 2 is 20, 3 is 30, and so on making the middle 1 now 100, the next 2 is 200, 3 is 300, 4 is 400, and 10 at the end is now 1000.

In like manner, if the first 1 be esteem'd for 1 tenth, the next 2 for 2 tenths, and the middle 1 is 1, and next 2 is 2, and 10 at the end is now 10: Again, if the first 1 be counted for 1 hundredth Part, the next 2 is 2 hundredth Parts, the middle 1 is now 10 hundredth Parts or 1 tenth Part, and next 2 is 2 tenth Parts, and 10 at the end, is now but 1 whole number or Integer.

Note 2. *As the Figures are increas'd or diminish'd in their Value, so in like manner must all the intermediate Stroaks or Sub-divisions be increas'd, or decreas'd:* That is, if the first 1 (at the Left-hand) be counted 1, then 2 (on the Right-hand of it) is 2, and each Sub-division between them is now 1 tenth Part; and so all the way to the middle 1, which now is 10, the 2 next it, is 20; now the longer Stroaks between 1 and 2, are to be counted from 1 thus, 11, 12, (where is a Brass-pin) then 13, 14, 15, (something a longer Stroak than the rest) then 16, 17, 18, 19, 20, at the Figure 2: And all the shorter Stroaks between these longer, are now each to be counted for a tenth Part, from the middle 1 to the next 2, now 20; from whence the longer Divisions, between the Figures, are Units; thus, 21, 22, 23, &c. to 3 which is 30; and the shorter Divisions, between them, each now is  $\frac{1}{10}$  or 2 tenths of an Integer; from whence each short Stroak or little Division, is  $\frac{1}{2}$  or 5 tenths of a Unit. Again,

Again, if 1 at the Left-hand be 10, the Figures between it and the middle 1, are common Tens, and the Subdivisions (between each Figure) are Units; and from the middle 1 to 10 at the end, each Figure is for many hundreds; and between these Figures each longer Division are Tens; and from the middle 1 to 2, each lesser Division is 1 Unit; from 2 to 3 each lesser Stroak is 2 Units, from the Figure 3 to the end, each shorter Stroak is 5 Units.

*Note 3.* On the *Line of Numbers*, may be counted a Number of any Denomination; whether Measure; as Inches, Feet, Yards, Miles, Leagues, &c. or Weight; as Hundreds, Pounds, Ounces, &c. or Money; as Pounds, Shillings, &c. or Time; as Years, Months, Days, Hours, &c. provided always the Integer be divided, or suppos'd to be divided *decimally*.

5. Next under *Numbers* is the *Line of Sines*, beginning at the Left-hand at about 25 Minutes, and figur'd thus; 2, 3, &c. to 10; then 20, 30, 40, &c. to 90, ending at the Right-hand, where is a Brass Center-pin: These figures never change their Value nor Denomination, being here (and in all the other Lines under it) Degrees.

From the Beginning of this Line to 10 Degrees, each Degree is divided into 12 Parts, by greater and lesser Stroaks, making each 5 Minutes; from 10 Degrees to 20, each smaller Stroak is 10 Minutes; from 20 to 30, each is 15 m. from thence to 60, some are 20, but the most are 30 m. each lesser Subdivision; and from 60 to 80, each Division is a Degree; 80 and 90 are so near together, that it admits but one Stroak between, which is for 85 Degrees.

6. Next to, and abutting on the *Line of Sines*, is the *Reversed Sines*, beginning at the Right-hand (against 90 in the *Sines*) and from thence figur'd towards the Left-hand thus; 10, 20, 30, 40, &c. ending at the left-end at about 160 Degrees; the Subdivisions are thus; from 10 to 30,

each



each is 2 Degrees; from thence to 90, it's single Degrees; from thence to 120, it's  $\frac{1}{2}$  Degrees; and from thence to the end it's divided into  $\frac{1}{4}$  d. or each 15 Minutes.

7. Under *Verfed Sines* is the *Line of Tangents*, beginning at the left end, as the *Sines* do; from thence figur'd to the Right-hand thus, 1, 2, 3, &c. to 10; and so on 20, 30, 40, and 45 on the Right-hand, where is a little Brass Center-pin, just under and even with that in the *Sines*; from thence back again, is figur'd 50, 60, 70, 80, &c. to 89; ending at the left end, where it began at 1 Degree: The Subdivisions of this Line, are (for the most) like those of the *Sines*; so passing that, I proceed

8. Next to the *Tangents*, and under it is the *Line of Meridional Parts*, beginning at the Right-hand, is figur'd thus, 10, 20, 30, &c. to the Left-hand, where it ends at 80 Degrees: This Line, with the Line of equal Parts under it, are us'd together, and only in that Part of Navigation, call'd *Mercator's Sailing*: The uppermost Line contains the Degrees of the Meridian, or Latitude in a Mercatory Chart; and the lower, as the Equinoctial, the Degrees of Longitude.

9. These 8 Lines now describ'd, are set on the *Sliding Gunter*, but not in the same Order, being some on one side, and some on t'other; also the Lines of Numbers, Sines and Tangents, are set double, that is, One on each side, as the middle piece slide: Which middle piece is so contriv'd to slip to and fro easily, to slide out, and to be put in any side uppermost, in order to bring those Lines together (or against one another) most proper for solving the Question, wrought by the *Sliding Gunter*: Of which let this short Description suffice.

### I. *The Use of Gunter's Scale, both single and sliding.*

IN order to a right understanding of the Uses of this Scale, it is necessary to number well on them; that



s, to find readily a Place representing any given Number, and that chiefly on the Line of Numbers; which is as follows,

PROBLEM 1.

*To find a Whole Number on the Line of Numbers.*

*Rule.*

**L**OOK the first Figure of the given Number among the figur'd Divisions.

2. For the second Figure, count so many Tenths or of the longer Stroaks from the figur'd Division, towards the Right-hand, as are Units in the said second figure.

3. Then for the third Figure, count from the last Tenth (representing the second Figure) so many lesser stroaks or Centesms as that Figure hath Units.

4. In like manner for the fourth Figure, count from the last Centesm, so many Thousands or lesser Stroaks as are Units in it; and so on for more Figures; though four Figures or Thousands, are as many as well can be discern'd on a Two-Foot Gunter.

5. This done, the last Place is the Point where the propounded Number is represented.

*Example 1. To find the Point in the Line of Numbers that doth represent 12.*

According to the Rule above, I take the Division at the Figure 1, in the middle of the Line of Numbers for the first Figure of 12. the propounded Number; then for 2 the second Figure, I count two Tenths or longer stroaks to the right-hand from the said Stroak at 1; and this last is the Point representing 12, where most commonly is a small Brass Center-pin, being oft in use.

*Example 2. Suppose the Point representing 22 on the Line of Numbers, were requir'd to be found.*

The first Figure in the Number 22 being 2, I take the Division at the figure 2 for it; and for the second Figure being 2, I count 2 Tenths onwards; and that the Point representing 22, at which (in some Gunters) a Brass Center-pin.

Example 3. *I desire to know the Point on the Line of Numbers, that doth represent 144.*

The first Figure being 1, I take the Division at the middle 1 for it; the second Figure being 4, I count Tenths onwards; from thence count 4 Centesims farther for the third and last Figure; this last Place is the Point representing 144.

Example 4. *Let it be required to find on the Line of Numbers, the Point representing 1728.*

For the figure 1, take the middle 1; for the second Figure 7, count as before onward 7 Tenths, and that is 700; then for 2, the third Figure, count 2 Centesims from the last, and it represents 22, lastly for the fourth Figure 8, estimate 8 Thousand Parts from the last this Point last found, representeth 1728.

PROB. II. *To find a Fraction or broken Number, on the Line of Numbers.*

THE Fractions to be found on this Line, ought always to be Decimal; as these, 1, 01, 001; 2, 02, 002, &c. that is,  $\frac{1}{10}$ ,  $\frac{1}{100}$ ,  $\frac{1}{1000}$ ;  $\frac{2}{10}$ ,  $\frac{2}{100}$ ,  $\frac{2}{1000}$ , &c. either in Inches, Feet, Yards, Miles, or the like; also in Weight or Time, or any other Denomination whatsoever.

So that all other Fractions must be reduc'd into Decimals, before they can be found on the Line of Numbers; and being so reduc'd, they are express'd and found upon this Line; as whole Numbers, by the Rule in Prob. I. and needs no Examples.

PROB.

PROB. III.

*To perform Multiplication by the Line of Numbers.*

*The Rule is;*

**A**S 1 is to the Multiplicand, so is the Multiplier to the Product.

Now to work this, or any Proportion on the Gunter, this is,

*A General Rule:*

1. Extend the Compasses from the first Term to the second.
2. That Extent in the Compasses laid the same way from the third Term, will reach to the fourth Term, or Thing requir'd.

*By the sliding Gunter, thus;*

1. Set the first Term (counted on the sliding or middle piece) right against the second Term, counted on the fixed Piece.
2. Then seek the third Term, always on the same the first Term was counted on the sliding Part; and against it, on the fixed Part, is the fourth Term or thing requir'd.

**Examp. 1.** *What is the Product of 8 multiplied by 4?*

The Analogy, or Proportion is this;

As 1 is to 8, so is 4 to the Product.

Or it is,

As 1 is to 4, so is 8 to the Product.

1. *By the Gunter with Compasses.*

Extend the Compasses from 1 to 8; that Extent set from 4 (the same way) reacheth to 32 the Product of 8 multiplied by 4.

M 3

Or,

Or the Extent from 1 to 4, being laid from 8, reacheth to 32, the Product, as before.

2. *By the sliding Gunter.*

Set 1 (at the beginning on the middle or sliding-piece) right against 8 (on the fix'd or out-side piece;) then against 4 (on the first) is 32, (on the second) the Product requir'd.

Or, set 1 (as before) against 4, then against 8 (on the first) is 32 (on the second) the Product, as before.

Examp. 2. *What is the Product of 16 multiplied by 5?*

The Proportion to work it by, is this :

As 1 is to 5, so is 16 to the Product.

1. *By Gunter with Compasses thus ;*

The Extent from 1 to 5, being laid from 16, reacheth to 80, the Product required.

2. *By the sliding Gunter.*

Set 1 (on the middle piece) against 5 (on the outside piece) then against 16 (on the first) is 80 (on the second) the Product requir'd.

PROB. IV. *To perform Division by the Line of Numbers.*

*The Rule or Proportion, is this ;*

**A**S the Divisor is to 1, so is the Dividend to the Quotient.

Example 1. *If the Dividend be 64, and the Divisor 4 ; what is the Quotient ?*

To do this, the Proportion is ;

As 4 is to 1, so is 64 to the Quotient.

1. *By the Gunter with Compasses, thus ;*

The Extent from 4 to 1, laid (the same was) from 64, reacheth to 16, the Quotient requir'd.



2. By Sliding Gunter, thus ;

Set 4 (on the middle Piece) against 1 (on the outside Piece) then against 64 (on the first) is 16 (on the second) which is the Quotient requir'd.

Example 2. How often is 144 contain'd in 1728 ?

To do this, the Proportion is this :

As 144 is to 1, so is 1728 to the Answer.

1. By Gunter, with Compasses, thus ;

The Extent from 144 to 1, reacheth from 1728 to 2, the Quotient or Answer requir'd.

2. By Sliding Gunter thus ;

Set 144 (on the middle Piece) against 1 (on the outside Piece) then against 1728 (on the first) is 12 (on the second) which is the Quotient requir'd.

PROB. V. To reduce a Vulgar Fraction to a Decimal, by the Line of Numbers,

To perform this, the Proportion is thus ;

AS the Denomination of the given Fraction is to its Numerator, so is 1 to the Decimal Fraction requir'd.

Example, Suppose it be requir'd to reduce  $\frac{3}{4}$  (a Vulgar Fraction) into a Decimal Fraction ?

Note,, A Decimal Fraction hath for its Denominator an Unit, with as many Cyphers as its Numerator hath Places: And the Proportion to find its Numerator, is thus ;

As 4 is to 3, so is 1 to the Numerator of the Decimal Fraction requir'd.

1. By Gunter, with Compasses thus ;

The Extent from 4 to 3, reacheth (the same way) from 1 to 75, or  $\frac{75}{100}$  the Decimal Fraction requir'd.

2. *By Sliding Gunter, thus;*

Set 4 (on the middle Piece) against 3 (on the outside Piece,) then against 1 (on the first) is 75, or  $7\frac{5}{10}$  on the second, the Decimal Fraction requir'd to be found: So that 75, or  $7\frac{5}{10}$  is equal in Value to  $\frac{3}{4}$ .

PROB. VI. *Of Continual Proportion, or Geometrical Progression; which is unto two given Numbers; to find a 3d, 4th, 5th, &c, Number, in a continued Proportion, by the Line of Numbers.*

*The Analogy by which it is effected, is this:*

**A**S the first Number given, is to the second, so is the second to a third; and so is that third to a fourth; and so is that fourth to a fifth, &c.

*Example. Let the two Numbers given be 2 and 4; unto which it's requir'd to find a 3d. a fourth Proportional, &c.*

For the Performance hereof the Rule is thus;

As 2 is to 4, so is 4 to a 3d; so is that 3d to a 4th, &c.

1. *By Gunter with Compasses, thus;*

The Extent from 2 to 4 reaches from 4 to 8, the 3d; and from 8 to 16 the 4th; and from 16 to 32, the 5th Proportional Number; and so on to as many as you please. So that 2, 4, 8, 16, 32, &c. are Numbers in continued Proportion Geometrical, as was requir'd.

2. *By Sliding Gunter, thus;*

Set 2 (on the middle Piece) to 4 (on the next side Piece,) then against 4 (on the first) is 8 (on the second) for the 3d Proportional; and against 8 (on the first) is 16 (on the second) the 4th Proportional; and in like manner again, 16 is 32 the 5th Proportional, as was requir'd; and so on for more.

PROB.

P R O B. VII.

*Of the Rule of Three Direct, or 3 Numbers given, to find a 4th in direct Proportion, by the Line of Numbers.*

*The Analogy whereby this is perform'd, is thus ;*

**A**s the first Number is to the second, so is the third to the fourth Number requir'd.

*Example 1. If the Diameter of a Circle be 7 Inches, and the Circumference thereof 22 ; What is the Circumference of a Circle, whose Diameter is 14 Inches ?*

*To perform this, the Analogy is thus ;*

*As 7 is to 22, so is 14 to the Circumference requir'd.*

*1. By Gunter with Compasses.*

*The Extent from 7 to 22, laid (the same way) from 14, will reach to 44, the Circumference of the Circle, whose Diameter is 14 ; which was requir'd.*

*2. By Sliding Gunter thus ;*

*Set 7 (on the middle Piece) against 22 (on the outside Piece) then again 14 (on the first) is 22 (on the second) which is the Circumference requir'd.*

*Example 2. If the Circumference of a Circle be 3.14, and its Diameter 1 ; What will the Diameter of another Circle be, whose Circumference is 44 ?*

*The Proportion is,*

*As 3.14 to 1, so is 44 to the Diameter requir'd.*

*1. By Gunter with Compasses, thus ;*

*The Extent from 3.14 to 1, reacheth from 44 to 14, the Diameter requir'd,*

*2. By*

2. *By Sliding Gunter, thus;*

Bring 3.14 (on the middle Piece) right against 1 (on the outside Piece) and then against 44 (on the first) is 14 (or the second) which is the Diameter requir'd.

*Note,* In the Rule of Three Direct; If the 3d Number be greater than the 1st, then will the 4th Number be greater than the 2d. But,

If the 3d Number be less than the 1st, then the 4th will be less than the 2d.

*Example 3.* If 30 Acres of Land be worth 25 Pounds a Year; how much a Year will 54 Acres be worth?

To do this, or any Question in the Rule of Three, always in the Proportion, let the first and third Numbers or Terms be of one Kind or Denomination: And in this it is.

As 30 Acres is to 25 Pound, so is 54 Acres to 45 Pound.

1. *By Gunter, with Compasses:*

The Extent from 30 to 25, reacheth from 54 to 45, the Yearly Rent requir'd.

2. *Also, By Sliding Gunter.*

Bring 30 against 25, then against 54 (on the first) is 45 (on the second) as before.

By this time the Reader is so well acquainted in the way of Working a Proportion on the Line of Numbers, with Compasses, or without, that it's a needless thing to express it in Words, being ever the same: Henceforward you shall have only the Proportion set down, leaving the manner of its Operation to your Practice, except in case where the Working differs from what went before.



PROB. VIII.

*Of the Rule of Proportion Inverse, or three Numbers given, to find a fourth in an Inverse Proportion (or in the backward Rule of Three) by the Line of Numbers.*

1. **I**N this Rule you must note, if the 3d Number be greater than the 1st, then will the 4th be less than the 2d: But,

2. If the 3d be less than the 1st, the 4th is to be greater than the 2d.

3. And to resolve Questions of the backward Rule of Three, the Proportion is thus;

As the third Number is to the second; so is the first to the fourth.

*Example. If 72 Pioneers make a Trench in 48 Hours; in how long time can 54 Pioneers make it?*

By the Directions above, this is the Proportion;

As 54 Men is to 48 hours, so is 72 Men to 64 hours; the Answer to the Question: From whence you may conclude, That 54 Men will perform as much in 64 hours, as 72 Men in 48 hours.

PROB. IX.

*Of Duplicate Proportions or 3 Numbers given, to find a 4th in a Duplicate Proportion, by the Line of Numbers.*

**T**HIS Rule is chiefly us'd in Proportion of Lines to Superficies, &c. Wherein the first and second Term are to be of one Kind or Denomination.

*Example 1. If the Diameter of a Circle be 1, and its Area or Content 0.78539: What's the Content of a Circle, whose Diameter is 1?*

To

To perform this, the first and second Terms by the Note above are to be Lines; that is, the Diameters given; and then the Proportion is thus:

As 1 is to 14, so is  $\circ.785$  to a 4th; and so is that 4th to the Content requir'd.

1. *By Gunter with Compasses.*

The extent from 1 to 14, reacheth from  $\circ.785$  to 11; and the same Extent laid the same way from 11, reacheth to 154, the Content requir'd.

2. *By the sliding Gunter.*

Bring 1 on the middle Piece right against 14 on the outside Piece, then against  $\circ.785$  (on the first) is 11 on the second, and against 11 on the first is 154 on the second, the Content requir'd.

Example 2. If the Diameter of a Circle be 7, and its Area 38.5 What is the Area of a Circle, whose Diameter is 12? Answer 112.

For, as 7 is to 12, so is 38.5 to 66; and so is 66 to 112.

Examp. 3. If the Diameter of a Circle be 1, and its Area  $\circ.78539$ ; What is the Diameter of a Circle, whose Area is 154? Answer 14.

In this the Proportion is of Superfices to Lines, which is thus;

As Area  $\circ.785$  is to Area 154, so is Square of Diameter 1, to Square of Diameter requir'd.

1. *By Gunter with Compasses.*

The Extent from  $\circ.785$  to 154, reacheth from 1 to 196, the Square of the Diameter requir'd.

Then divide the space between 1 always the middle 1, if the number of Places be odd; but if even, the first

first 1) and 196, into two equal Parts the Foot in the middle resteth at 14, the Diameter of the Circle, whose Area is 154.

2. By the sliding Gunter,

Bring 0.785 against 154, and against 1 on the first is 196 (on the second;) then find the middle between 1 and 196, which is at 14, the Diameter as before.

Example 4. The Diameter of a Circle being 1, and its Area 0.785; What is the Diameter of a Circle, whose Area is 112? Answer 12.

For as 0.785 is to 112, so is 1 to 144; the middle between it and 1, is at 12, the Diameter requir'd.

# PROB. X.

Of Triplicate Proportion, or 3 Numbers given; to find a 4th in a Triplicate Proportion, by the Line of Numbers.

**T**HIS Problem concerneth the Proportion of Lines to Solids, and the contrary; in which evermore make the first and second Term to be of one Denomination:

Examp. 1. If an Iron Bullet weigh 9 Pounds, and its Diameter is 14 Inches; What is the Weight of another Iron Bullet, whose Diameter is 6 Inches?

To perform this, the first and second Terms are to be Lines; that is, the given Diameters, and then the Proportion is thus;

As 4 is to 6, so is 9 to 13.5; and so is 13.5 to 20.2, so is 20.2 to 30.3, that is, 30 Pounds three Tenths of a Pound; which is the Weight required.

.1 That

## 1. That is, By Gunter with Compasses

The Extent from 4 to 6, being laid 3 times from 9, will reach to 30 Pounds  $3\frac{1}{2}$  Tenths, the Weight requir'd

## 2. And, By sliding Gunter, thus;

Set 4 against 6, and against 9 on the first is 13.5 on the second; then against 13.5 on the first is 20.2 on the second; and against 20.2 on the first is 30.3 on the second; that is 30 Pounds  $3\frac{1}{2}$  Tenths, as before.

Example 2. If an Iron Bullet 1 Inch Diameter weigh Pound 0.1406 Parts; What is the Weight of another, whose Diameter is 4 Inches, it being of the same Metal? Answer, 9 Pound. For,

As 1 is to 4, so is 0.1406 to 0.563; and so is 0.563 to 2.25; and so is 2.25 to 9 Pounds, the Weight required.

Example 3. If a Gun 6 Inches Bore require 11 Pound of Powder; How much will serve a Gun 4 Inches Bore? Answer, Pounds 3.25 parts. For,

As 6 to 4, so is 11 to 7.3; and so is 7.3 to 4.88; and so is 4.88 to 3.25; which is Pounds; 3.25 parts of a Pound, or Pounds  $3\frac{1}{4}$ .

Example 4. If an Iron Bullet 1 Inch Diameter weigh Pound 0.1406 parts; What Diameter shall that be which weigheth 9 Pound of the same Metal? Answer, 4 Inches For,

As 0.1406 is to 9, so is 1 to 64, the Cube of the Diameter requir'd; then divide the space between 1 and 64 into 3 equal Parts, and the Foot in the first  $\frac{1}{3}$  part from 1 reacheth to 4, the Diameter of the Iron Shot weighing 9 Pounds.

II. The



II. The Use of the Line of Numbers (commonly called Gunter's Line) in Measuring Superficies, as Board, Glass, Land, &c. and Solids, as Timber, Stone, Gauging, &c.

PROB. I.

The Length and Breadth of any Square, or long Square, Superficies given; to find the Area or Content thereof.

The Proportion is this;

AS 1 is to the Breadth, so is the Length to the Content.

Example 1. A plain Superficies, as a Board or Plank be given to be measur'd; the Breadth thereof is 15 Inches, and its Length 61 Inches; What is the Content of it? Answer, 915 Inches. For,

As 1 to 15, so is 61 to 915 Inches, the Content requir'd.

Note, Such as the Breadth and Length is, such is the Content; so that if the Breadth and Length be Feet, the Content is Feet; if Perches, then Perches, &c.

Example 2. A Piece of Wainscot, in Form of a long Square, whose Length is Feet 15.5 Parts, and Breadth Feet 2.25 Parts; What is the Content? Answer, Feet 34.86 Parts. For,

As 1 is to 2.25, so is 15.5 to 34.86, the Content requir'd.

PROB. II. The Breadth and Length of a Superficies given in one kind of Measure; to find the Content thereof in another kind of Measure.

To do this, the Proportion is thus:

AS the other kind of Measure is to the Breadth, so is the Length to the Content.

Exam-

**Example 1.** *A Plank or Board 15 Inches broad, 61 Inches long; I demand the Content of it in Feet? Answer, Feet 6.35 parts.*

In a Foot superficial, or a Square Foot, is 144 square Inches, and therefore the Proportion is thus:

As 144 is to 15 Inches, so is 61 Inches to Feet 6.35 Parts of a Foot.

**Examp. 2.** *A Piece of Land, in form a long square, whose Breadth being 30 perches, Length 183 perches; What is the Content in Acres? Answer 34.35 parts.*

For 160 Perches is an Acre, and the Proportion is thus;

As 160 is to 30 Perches, so is 183 Perches to Acres 34.35 parts of an Acre.

**Examp. 3.** *A piece of Painting, in form a long Square, whose Breadth, Feet 3.5, and Length 21 Feet; How many square Yards is the Content? Answer, Yards 8.16 parts.*

For 9 Feet being a Yard square, the Proportion is thus;

As 9 is to 3.5 Feet, so is 21 Feet to Yards 8.16 parts.

**PROB. III.** *The Breadth of a Superficies given in one kind of Measure, and the Length in another, to find the Content in the greater Measure.*

To do this, the Proportion is thus,

**AS** the greater Measure is to the Breadth, so is the Length to the Content requir'd.

**Example 1.** *Admit a Board 10 Inches broad, and 20 Feet long; I demand the Content in Feet? Answer, Feet 16.6 Tenths of a Foot.*

For the Proportion is thus;

As 12 is to 10 Inches, so is 20 Feet to Feet 16.6 Tenths.

**Example**

Example 2. If a Board or Plank be 15 Inches broad, and 27 Feet long; What is the Content of it in Feet? Answer, Feet 33.75 parts of a Foot, or  $33\frac{3}{4}$  Feet. For it is,

As 12 is to 15 Inches, so is 27 Feet to Feet 33.75 parts.

Example 3. A Board  $7\frac{1}{2}$  Inches broad, and  $29\frac{1}{4}$  Feet long; What's the Content in Feet? Answer, Feet 18.4 Tenths. For it is,

As 12 is to 7.5, so is 29.25 to Feet 18.4 Tenths.

Example 4. A Piece of Land (in form a long square) whose Breadth is 30 Perches, and Length is Chains 15.25 Links (measured by a Chain of 4 Perches in 100 Links; I demand the Content thereof in Acres? Answer, Acres 11.4 Tenths. For it is,

As 40 is to 30 Perches, so is Chains 15.25 to Acres 11.4 Tenths of an Acre.

PROB. IV. The Breadth of a Superficies given; to find how much in Length will make a Foot, a Yard, a Perch, or an Acre, &c.

To do this, take this General Rule.

AS the Breadth is to a Foot, (a Yard, &c.) so is a Foot, (a Yard, &c.) to the Length, which will make a Foot (a Yard, &c.)

Example 1. If a Board be  $7\frac{1}{2}$  Inches broad; How much in Length will make a Foot square; Answer, Inches 19.2 Tenths of an Inch.

For the Proportion is thus;

As 7.5 is to 12, so is 12 to Inches 19.2 Tenths.

Example 2. A Plank 30 Inches broad; How much in Length will make a Foot? Answ. Inches 4.8 tenths of an Inch. For it is,

As 30 Inches is to 12, so is 12 to Inches 4.8 Tenths.

Example 2. A Pane of Glass being in Breadth, Feet 2.5 tenths; How much in Length will make a Foot? Answer, 4 Tenths of a Foot. For it is thus;

As 2.5 is to 1 Foot, so is 1 Foot to 0.4 Tenths of a Foot.

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**Example 4.** *A Piece of Matting being 27 Inches broad ; How much in Length will make a Yard square ? Answer 48 Inches or 4 Feet. For it is thus ;*

*As 27 Inches is to 36 Inches, so is 36 Inches to 48 Inches : But if the Breadth be given in Feet ; that is, for 27 Inches, it be  $2\frac{1}{4}$  Feet, or 2.25 Feet : Then it is thus ;*

*As 2.25 is to 3 Feet so is 3 Feet to 4 Feet in Length to make a Yard square.*

**PROB. V.** *The Diameter of a Circle given, to find the Circumference.*

*The Analogy or Proportion, is thus ;*

**A** *S* 1 is to 3.142, so is the Diameter to its Circumference.

**Example.** *If the Diameter of a Circle be 15 Inches ; What is the Circumference of it ? Answer, Inches 47.12 parts For,*

*As 1 is to 3.142, so is 15 Inches to Inches 47.12 parts*

**PROB. VI.** *The Circumference of a Circle given, to find its Diameter.*

*The Proportion stands thus ;*

**A** *S* 3.142 is to 1, so is the Circumference to its Diameter.

**Example.** *The Circumference of a Circle being 44 Feet What is the Diameter thereof ? Answer Feet 14. For it is*

*As 3.142 is to 1, so is 44 Feet to Feet 14.*

**PROB. VII.** *The Diameter of a Circle being given ; to find its superficial Content.*

*The Analogy is thus ;*

**A** *S* 1 is to the Diameter, so is 0.7854, to a 4th Number, and so is that 4th to the Superficial Content requir'd.

**Examp.** *The Diameter of a Circle being 15 Inches, What is the Content of it ? Answ. Inches 176.7 tenths.*

*For it is,*

*As*



*The Mariners Compass Rectified.*

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As 1 is to 15, so is 0.7854 to 11.78; and so is 11.78 to 176.7 the Superficial Content requir'd.

ROB. VIII. The Circumference of a Circle being given, to find the Superficial Content of it.  
The Proportion is thus;

As 1 is to the Circumference, so is 0.07958 to a 4th and so is that 4th to the Superficial Content requir'd.

Example. If the Circumference of a Circle be 44 Inches; what's the Content? Answer, Inches 154.06 parts of an Inch. or it is,

As 1 to 44, so is 0.07958 to 3.5; and so is 3.5 to 154.06.

I. The Use of the Line of Numbers in Solid Measure, such as Timber, Stone, Gauging, &c.

ROB. I. The Side of a square Solid given in Inches, to find how much in Length will make a Foot solid.

The Proportion, is thus;

As the given Side is to 12, so is 12 to a 4th Number; and so is that 4th Number to the Length requir'd to make a Foot solid.

Example 1. A square piece of Timber or Stone, whose breadth and Depth, each 8 Inches; How much in Length will make a Foot Solid? Answer, 27 Inches or 2 Feet 3 Inch. or it is,

As 8 is to 12, so is 12 to 18; and so is 18 to 27 Inches.

Example 2. A square Piece of Timber or Stone, whose sides 2 Feet or 24 Inches: How much in Length will make a Foot? Answer, 3 Inches. For it is,

As 24 is to 12, so is 12 to 6; and so is 6 to 3 Inches

**PROB. II.** The Side of a square Solid given in Foot measure (which is the Decimal Foot, or a Foot divided into 100 equal Parts; ) to find how in Length will make a Foot Solid.

*The Proportion is thus;*

**A**S the given Side is to 1, so is 1 to a 4th Number and so is that 4th Number to the Length required to make a Foot Solid.

*Example.* A square Piece of Timber, whose Side is Feet 1.52 parts; How much in Length will make a Foot Solid? Answer, 0.438 parts of a Foot. For it is,

As 1.52 is to 1, so is 1 to 0.664; and so is 0.664 to 0.438 parts of a Foot.

**PROB. III.** The Breadth and Depth of a Solid, whose two Ends are equal long Squares, being given in Inches, or Foot-measure; to find how much in Length will make a Foot Solid.

*1. The Proportion for Inches, is thus;*

**A**S 12 is to the Breadth, so is Depth to a 4th Number: Then,

As that 4th Number is to 12, so is 12 to the Length in Inches to make a Foot Solid.

*2. The Proportion for Foot-measure, is thus;*

As 1 is to the Breadth, so is the Depth to a 4th Number: Then,

As that 4th Number is to 1, so is 1 to the Length in Foot-measure to make a Foot Solid.

*Example 1.* A Piece of Timber or Stone, whose Breadth is 11 Inches, and Depth 19 Inches; How much in Length will make a Foot? Answer, Inches 8.26 parts. For it is,

As 12 is to 11, so is 19 to 17.5: And then say,

As 17.5 is to 12, so is 12 to Inches 8.26 parts in Length to make a Foot Solid.

*Example 2*

**Example 2.** *A Piece of Timber, in Breadth Foot 0.75 parts, and Depth Foot 1.25 parts; How much in Length will make a Foot Solid? Answer, Foot 1.06 parts. For it is,*  
 As 1 is to 0.75, so is 1.25 to 0.94 : Then say,  
 As 0.94 is to 1, so is 1 to Foot 1.06 parts in Length to make a Foot.

**PROB. IV.** *The Side of a square Solid, and its Length being given; to find the Content.*

1. **W**hen the Side is given in Inches, and Length in Feet, the Proportion is thus;  
 As 12 is to the given Side, so is the Length to a 4th Number; and so is that 4th Number to the Content in Feet.

2. When the Side and Length are both given in Foot-measure, the Proportion is thus;  
 As 1 is to the given Side, so is the Length to a 4th Number; and so is that 4th Number to the Content requir'd.

**Example 1.** *A square Piece of Timber, whose Side is 9 Inches, and Length 35 Feet; How many Feet of Timber is in it? Answer, Feet 19.85 parts. For it is,*  
 As 12 is to 9, so is 35 to 26.4; and so is 26.4 to Feet 19.85 parts

**Example 2.** *A Piece of Timber 16 Inches square, and 28 Feet long; How much is the Content? Answer, 50 Feet. For it is,*

As 12 to 16, so is 28 to 37.4; and so is 37.4 to 50 Feet

**Examp. 3.** *A Stone, Feet 2.75 parts square, and Feet 7.50 parts long; How much is the Content? Answer, Feet 36.52 parts. For it is,*  
 As 1 to 2.75, so is 7.50 to 20.6; and so is 20.6 to Feet 36.52 parts

## PROB. V.

*The Length, Breadth, and Depth of a Square Solid being given to find the Solid Content.*

1. **I**F the Breadth and Depth be given in Inches, and the Length in Feet, the Proportion is thus;  
As 12 is to the Breadth, so is the Depth to a 4th Number: Then say,

As 12 is to that 4th Number, so is the Length in Feet to the Content in Feet.

2. When the Length, Breadth, and Depth are all given in Foot-measure, then the Proportion is thus;

As 1 is to the Breadth, so is the Depth to a 4th Number: And then again say,

As 1 is to that 4th Number, so is the Length to the Content in Feet.

Examp. 1. *If a Square Piece of Timber be in Breadth 19 Inches, Depth 11 Inches, and 20 Feet long; How much is the Solid Content? Answ. Feet 29.03 Parts. For it is thus;*

As 12 to 19, so is 11 to 17.4: Then say,

As 12 to 17.4, so is 20 to Feet 29.3 Parts, the Content requir'd.

Example 2. *A Stone 20 Inches broad, 13 Inches deep, and Feet 15.25 or  $15\frac{1}{4}$  Feet: How much is the Content?*

Answer, Feet 27.5 or  $27\frac{1}{2}$  Feet. For it is,

As 12 to 20, so is 13 to 21.67: And then,

As 12 to 21.67, so is 15.25 to 27.5; that is  $27\frac{1}{2}$  Feet.

Example. 3. *A squar'd Piece of Timber, Feet 1.25 broad, Feet 0.56 deep, and 36 Feet long; How much is the Content?*

Answer, Feet 25.20 Parts, or  $25\frac{1}{5}$  Feet. For it is,

As 1 is to 1.25, so is 0.56 to 0.70: And then,

As 1 is to 0.70, so is 36 to Feet 25.2 Tenths.

## PROB. VI.

*The Diameter of a Cylinder given, to find how much in Length will make a Foot-solid.*

1. **I**F the Diameter be given in Inches, the Proportion is thus;

As



As the given Diameter is to 13.531, so is 12 to a 4th Number; and so is that 4th Number to the Length requir'd to make a Foot solid.

2. When the Diameter is given in Foot-measure, the Proportion is thus;

As the given Diameter is to 1.128, so is 1 to a 4th Number; and so is that 4th Number to the Length, which will make a Foot-solid.

Examp. A round Piece of Timber, or Stone, being 15 Inches Diameter; How much in Length will make a Foot-solid? Answer, Inches 9.78 parts of an Inch. For it is,

As 15 is to 13.531, so is 12 to 10.75; and so is 10.75 to Inches 9.78 parts, or  $9\frac{78}{100}$  Inches.

But supposing the Diameter of the same to be taken in Foot-measure; then its Foot 1.25 Parts; Now how much will make a Foot? Answer, Foot 0.82 parts of a Foot. For it is thus

As 1.25 is to 1.128, so is 1 to 0.905; and so is 0.905 to Foot 0.815 Parts, or  $\frac{815}{1000}$  Foot.

PROB. VII.

*The Circumference of a Cylinder given; to find how much in Length will make a Foot solid?*

1. **W**HEN the Circumference is given in Inches, the Proportion is;

As the Circumference is to 42.54, so is 12 to a 4th Number; and so is that 4th Number to the Length requir'd to make a Foot-solid.

2. But if the Circumference be given in Foot-measure, then the Proportion is;

As the Circumference is to 3.545, so is 1 to a 4th Number; and so is that 4th Number to the Length, to make a Foot-solid.

Examp. If a round Stone, or Tree, be 44 Inches about; How much in Length will make a Foot? Answer, Inches 11.22 Parts, For it is,

As 44 to 42.54, so is 12 to 11.52; and so is 11.52 to Inches 11.22 parts of an Inch, or  $11\frac{22}{100}$  Inches.

But suppose the same was measured by Foot-measure, and the Circumference found to be Feet 3.67 parts; How much in Length will make a Foot? *Answer*, Foot 0.935 parts. For it is thus;

As 3.67 is to 3.545, so is 1 to 0.967; and so is 0.967 to Foot 0.935 parts or  $\frac{935}{1000}$  Foot.

**PROB. VIII.** *The Diameter and Length of a Cylinder given; to find its solid Content.*

1. **W**HEN the Diameter is given in Inches, and Length in Feet, the Proportion is thus,  
As 13.531 is to the Diameter, so is the Length to a 4th Number; and so is that 4th Number to the solid Content in Feet.

2. If the Diameter and Length are both given in Foot-measure, then the Proportion is thus;

As 1.128 is to the Diameter, so is the Length to a 4th Number; and so is that 4th Number to the Content required.

*Example, A round Piece of Timber 10 Inches through, and 30 Feet long; How many Feet of Timber is in it? Answer, Feet 16.35 parts. For it is.*

As 13.531 to 10, so is 30 to 22.18; and so is 22.18 to Feet 16.35 parts of a Foot, or  $16\frac{35}{100}$  Feet.

But suppose the same Piece measur'd by Foot-measure, then it's Foot 0.83, parts thro': And the Work is thus;

As 1.128 to 0.83, so is 30 to 22.18; and so is 22.18 to Feet 16.35 parts, or  $16\frac{35}{100}$  Feet, as before.

**PROB. IX.** *The Circumference and Length of a Cylinder given; to find the Solid Content.*

1. **I**F the Circumference be given in Inches, and Length in Feet, the Proportion is thus;

As

As 42.54 is to the Circumference, so is the Length to a 4th Number; and so is this 4th Number to the solid Content in Feet.

2. When the Circumference and Length are both in Foot-measure, the first Term being 3.545, (instead of 42.54) the former Words will serve here.

Example. *Around Stone or Tree, being 30 Inches about, and 25 Feet long; How many Feet solid are in it? Answer, Feet 12.5 parts.* For it is thus;

As 42.54 is to 30, so is 25 to 17.62; and so is 17.62 to Feet 12.52 parts, or  $12\frac{52}{100}$  Feet.

Now the Compass about being taken in Foot-measure, its Feet 2.50 parts, and the Proportion is;

As 3.545 to 2.50, so is 25 to 17.62; and so is 17.62 to Feet 12.53 parts, or  $12\frac{53}{100}$  Feet, as before.

Note, 1. When Timber tapers, that is, is bigger at one end than at t'other, it's usual to take the Breadth and Depth in the middle of its Length; and by them to measure the Piece as if it were both ends of a bigness.

Note, 2. The Proportions for Foot-measure, are the same, when all the Dimensions are taken in Inches; only then the solid Content found is Inches.

Note, 3. The solid Content in Inches, divided by 1728, the Quotient is Feet; but if divided by 282, or 231, the first is Beer, and the latter is Wine-Gallons: And how to divide by the *Line of Numbers* was shew'd in Prob. 4. of the first Uses of the Gunter.

PROB. X. *The Diameter of a Cask at Head and Bung, and also its Length given in Inches; to find its Content in Gallons, Beer or Wine.*

*The Rule is thus;*

1. **A** S 1 is to 0.7 so is the Difference of Bung and Head-Diameters to a 4th Number; which being added to the Head-Diameter, the Sum is the Mean-Diameter, reducing the Cask to a Cylinder. Then say,

2. **A**

2. As the Gauge-point (which for Beer or Ale is 18.95 but for Wine 17.15) is to the mean Diameter, so is the Length to a 4th Number; and so is this 4th Number to the Content in Gallons requir'd.

Examp. Suppose a Cask whose Length is—407

Diameter at \_\_\_\_\_ { Bung 28 } Inches :  
 { Head 20 }

} Ring 28 }  
 } Head 20 }

What's the Content of this Cask in Gallons, Beer or Wine?

Answer, 73 Gallons Beer, and Wine Gallons 89.2 Tenths.

See the Work following :

Bung Diameter ————— 28 Inches.

Head Diameter ————— 20

Their Difference is \_\_\_\_\_ 8 Inches.

Then, As. 1 to 0.7, so is 8 to 5.6; which added to 20, the *Head-Diameter*, makes 25.6 for the *Mean Diameter*; Then say,

As  $\left\{ \begin{smallmatrix} 18.95 \\ 17.15 \end{smallmatrix} \right\}$  is to 25.6, so is 40 to  $\left\{ \begin{smallmatrix} 54. \\ 59.76 \end{smallmatrix} \right\}$  and so is  
 $\left\{ \begin{smallmatrix} 54. \\ 59.76 \end{smallmatrix} \right\}$  to  $\left\{ \begin{smallmatrix} 73. \text{ Beer} \\ 89.2 \text{ Wine} \end{smallmatrix} \right\}$  Gallons.

$\left. \begin{array}{l} 54. \\ 59.76 \end{array} \right\} \text{to } \left\{ \begin{array}{l} 73. \text{ Beer} \\ 89.2 \text{ Wine} \end{array} \right\} \text{Gallons.}$

$\left. \begin{array}{l} 54. \\ 59.76 \end{array} \right\} \text{to } \left\{ \begin{array}{l} 73. \text{ Beer} \\ 89.2 \text{ Wine} \end{array} \right\} \text{Gallons.}$

$\left. \begin{array}{l} 54. \\ 59.76 \end{array} \right\} \text{to } \left\{ \begin{array}{l} 73. \text{ Beer} \\ 89.2 \text{ Wine} \end{array} \right\} \text{Gallons.}$

i. By Gunter, with Compasses.

1. The Extent from 1 to 0.7, will reach the same way from 8 to 5.6; which being added to 20 (the Head Diameter) makes 25.6 for the Mean Diameter. Then,

2. The Extent from 18.95 (the Gauge-point for Beer) to 25.6, will reach from 40 to 54, and that Extent turn'd over again, reacheth to 73, the Content in Beer Gallons.

In like manner, the Extent from 17.15, the Gauge-Point for Wine, to 25.6, being laid twice from 40, will reach to 89.2, the Wine-Gallons.

2. *By the Sliding Gunter.*

1. Set 1 against 0.7 and against 8 on the first, is 5.6 on the second; which added to 20, the Head Diameter, makes 25.6 for the Mean Diameter. Then,

2. Set



2. Set 18.95 (the Gauge-Point for Beer) on the first against 25.6 on the second; then against 54 on the first is 73 on the second, the Content in Beer-Gallons.

Also, if you set the Gauge-Point for Wine 17.15, against the Mean Diameter 25.6; then against the Length of the Cask 40 on the first, on the second you will find 59.76; and against 59.76 on the first, you'll find on the second 89.2, the Content in Wine-Gallons.

P R O B. XI. *The Length of a Ships Keel, and breadth at the Beam given; to find her Tunnage.*

IT's the Practice of the Ship-Wrights about London, to multiply the Length of the Keel, Breadth, and half-breadth into one another; and to divide the last Product by 94; whose Quotient they count for the Ship's Tunnage; from whence I frame this Proportion following, to be wrought by the Line of Numbers.

1. As 188 is to the breadth, so is the breadth to a 4th Number: Then say,

2. As 1 is to that 4th Number, so is the Length to the Tunnage requir'd.

Example *Suppose a Ship 72 Feet by the Keel, and 24 Feet by the Beam; I demand her Tunnage?* Answer, *Tuns 220.6 Tenths nearst.* See the Work:

As 188 to 24, so is 24 to 3.06: And then,

As 1 is to 3.06, so is 72 to Tuns 220.6 Tenths.

That is by the Gunter with Compasses.

1. The Extent from the Given Number 188 to the Breadth of the Beam 24: will reach from the said Breadth 24 to 3.06. Then,

2. The Extent from 1 to 3.06, will reach from the Length of the Keel 72, to Tuns 220.6 Tenths, the Tunnage requir'd.

Or more briefly thus;

The Extent from 13.71, (which is the Square-Root of the

the Given Number 188) to the Breadth of the Beam 24, being turn'd over twice from the Length of the Keel 72, reacheth to Tuns 220.6 Tenths as before.

2. By the sliding Gunter.

1. Set the Given Number 188 against the Breadth of the Ship 24, and against the said Breadth 24 on the first is 3.06, on the second. Then,

2. Set 1 against 3.06, and against the Length of the Keel 72 on the first, is Tuns 220.6 Tenths on the second as before.

PROB XII. To find the Tunnage of a Box, Bail, or Case, having its Length, Breadth, and Depth given.

The Rule is thus ;

1. AS 66 is to the Breadth, so is the Depth to a 4th Number: Then,

2. As 1 is to this 4th Number, so the Length to its Tunnage requir'd.

Examp. A Case, or Bail, being 6 Feet broad, 4 Feet deep, and 10 Feet long ; I demand its Tunnage? Answer 3.63 parts. For it is,

As 66 is to 6, so is 4 to 0.363 : And then,

As 1 is to 0.363. so is 10 to Tuns 3.63 parts.

1. By Gunter's Scale with Compasses.

1. The Extent from the Given Number 66 to the Breadth 6, reacheth from the Depth 4 to 0.363. Then,

2. The Extent from 1 to the last found Number 0.363 being laid from the Length 10, reacheth to 3.63 ; that is, 3 Tun and 63 parts of 100, or  $3\frac{63}{100}$ .

2. By the sliding Gunter thus ;

1. Set the Given Number 66 against the Breadth of the Bale or Case 6, then against the Depth of it 4 on the 1st, you

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you will find 0.363 on the second, a 4th Proportional Number. Then,

2. Set 1 against the said Proportional Number 0.363, then against the Length of the Bale or Case 10 on the first, you will find on the second 3.63, or  $3\frac{63}{100}$ , the Tunnage of the Bale or Case proposed.

Note, That 66 Feet is the Content of a Case that will inclose 2 English Butts, but the Cantlings of them being better than  $\frac{1}{2}$  part; therefore allowing 26 Feet for the Cantlings, the remaining 40 Feet is counted 1 Tun, and then the Rule is;

1. By Gunter with Compasses for the foresaid Example.

As 40 is to 6, so is 4 to 0.6 And then,

As 1 is to 0.6, so is 10 to 6 Tuns, the Content of the Case, or Bale required.

2. By the sliding Gunter, thus;

1. Set (the given Number) 40 against the Breadth of the Bale or Case 6; then against the Depth of it 4, on the first, you will find 0.6 on the second, a 4th Proportional Number. Then,

2. Set 1 against the said Proportional Number 0.6; then against the Length of the Bale or Case 10 on the first, you will find on the second 6, the Tunnage of the Bale or Case propos'd,

PROB. XIII. *The Diameter of a Globe given; to find its solid Content.*

*The Rule.*

AS 1 is to the Diameter, so is 0.5236 to a 4th Number; and so is that 4th to a 5th; and so is this 5th to its solid Content requir'd.

Example. A Globe whose Diameter is 8 Inches; What's the solid Content? Answer, Inches 268. For it is wrought thus;

As

As 1 to 8, so is 0.5236 to 4.19 ; and so is 4.19 to 33.5 ; and so is 33.5 to 268 Inches.

#### IV. *The Use of the Line of Numbers in Gunnery.*

PROB. I. *The Diameter and Weight of any piece of Ordnance known ; to find the Weight of any other being of the same Metal and Shape, its Diameter being known.*

Like Solids are in Proportion, as the Cubes of their agreeing Sides ; therefore,

*The Rule is thus ;*

AS the Diameter of the known Gun is to the Diameter of the Gun whose Weight is requir'd ; so is the Weight of the known Gun to a 4th Number ; and so is that 4th to a 5th, and so is that 5th to the Weight requir'd.

Example. Suppose a Brass Saker, whose Diameter is Inches 11.5 Tenths, do weigh 1900 pounds; what will a Brass Gun weigh, whose Diameter is Inches 8.75 parts? Answer, 840 pounds. For it is,

As 11.5 is to 8.75. so is 1900 to 1440 ; and so is 1440 to 1110 ; and so is 1110 to 840 Pounds.

1. That is, By Gunter's Scale with Compasses.

The Extent from the Diameter 11.5 to the Diameter 8.75, being laid three times from the Weight 1900, will reach to 840 Pounds, the Weight of the Gun requir'd. And,

2. By the Sliding Gunter, thus ;

Set the Diameter 11.5. against the Diameter 8.75, then against the Weight 1900 on the first, is 1440 on the second ; and against 1440 on the first, is 1110 on the second : Also against 1110 on the first, is 840 Pounds, the Weight requir'd.

PROB.



PROB. II. Having the Diameter and Weight of one Piece of Ordnance, and the Diameter of another Piece of another Metal; to find the Weight of the last, it being of the same Shape with the former.

The Rule is thus;

1. Find the Weight of the Piece, as if it had been of the same Metal the propounded Piece is, by the last Problem. Then,
2. Consider the Proportions of Metals; which are these, according to the best Authors.

Brass	} is to	Iron	} As	$\left\{ \begin{array}{l} 9 \\ 3 \\ 4 \\ 8 \end{array} \right\}$	} is to	8.
Lead		Iron				2.
Lead		Stone				1.
Iron		Stone				3.

3. Having the Weights of both Pieces in one sort of Metal, you must then proportion their Weight according to their different Metals, by the proportional Numbers of those Metals; and then it's done.

Examp. If a Brass Saker of Inches 11.5 tenths, weigh 1900, What will an Iron Gun, of the same Shape weigh, whose Diameter is Inches 8.75 parts? Answer, 746 Pound.

For it is wrought thus;

1. I find by Prob. I. that a Brass Piece, of Inches 8.75 will weigh 840 Pounds; but because this Piece is Iron, and the Proportion of Brass to Iron (as abovesaid) is as 9 to 8: therefore say,
2. As 9 is to 8, so is 840 to 746 Pounds.

PROB. III. By knowing the Allowance of Powder for one Gun; to find how much of the same Powder is requisite for another Gun.

The Rule.

AS the Diameter of the Bore of the Gun whose Allowance is known, is to the Diameter whose Allowance

lowance is requir'd ; so is the Allowance given to a 4th Number ; and so is that 4th to a 5th, and so is this 5th to the Allowance requir'd.

But *Note*, Here it is understood, that both Guns are alike fortify'd : that is, they should have the same Proportion in Weight, and Thickness of Metal.

*Example.* If a Saker of Inches 3.5 Tenths Bore, require a Pound of Powder ; What will a Demi-Cannon of Inches 6.5 Tenths Bore require ? Answer, Pounds, 25.58 parts. For as it is,

As 3.5 is to 6.5, so is 4 to 7.44 ; and so is 7.44 to 13.82 ; and so is 13.82 to Pounds 25.58 parts, the Weight of Powder for the Demi-Cannon in Proportion to the given Saker. But suppose the Weight of the Saker 1600 ; and the Weight of the Demi-Cannon 6000 ; What Allowance of Powder must it then have ?

1. By *Prob. 1.* find the Weight of the Demi-Cannon in Proportion to the Saker's Weight : Which is thus ;

As 3.5 to 6.5, so is 1600 to 2960 ; and so is 2960 to 5500 ; and so is 5500 to 10020 Pounds, the Weight of the Demi-Cannon requiring Pounds 25.58 parts of Powder for its Loading. But seeing its Weight is suppos'd to be 6000 ; say,

2. As 10020 is to 6000, so is 25.58 to Pounds 15, the due Allowance of Powder for the Demi-Cannon of Inches 6.5 tenths Bore, and weighing 6000 Pounds ; at the rate a Saker Inches 3.5 tenths Bore, weighing 1600 Pounds, doth require 4 Pounds of Powder.

**PROB. IV.** Having the Diameter and Weight of one Bullet, and the Diameter of another of the same Metal given ; to find the Weight of the latter.

*The Rule.*

**T**HE Weights of Bullets (of the same Metal) are in Triplicate Proportion of their Diameters, and wrought by Directions in *Prob. 10.* of the first Uses of the Gunter.

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**Example.** If an Iron Bullet 4 Inches Diameter weigh 9 Pounds; what will an Iron Bullet of six Inches Diameter weigh? Answer, Pounds 30.3 Tenths. For it is thus;

As 4 to 6, so is 9 to 13.5; and so is 13.5 to 20.2; and so is 20.2 to Pounds 30.3 Tenths.

**PROB. V.** Two Bullets equal in Diameter, but of differing Metal; by the Diameter and Weight of one, to find the Weight of the other.

*The Rule.*

**A**S the Proportion of one Metal is to the other, so is the Weight of the given Bullet to the Weight of the Bullet requir'd.

**Example.** Suppose an Iron Bullet 6 Inches Diameter, weigh Pounds 30.3 Tenths; what will a Stone Bullet of the same Diameter weigh? Answer, Pounds 11.36 parts. For it is wrought thus;

By Prob. 2. Of Gunnery, the Proportion of Iron and Stone, is as 8 to 3; therefore say,

As 8 is to 3, so is 30.3 to Pounds 11.36 parts.

**PROB. VI.** Having the Diameter and Weight of a Bullet of one kind of Metal, and the Diameter of another Bullet of another Metal given, to find the Weight of the latter

*The Rule.*

1. **F**ind the Weight of it (by Prob. 4.) as if it were of the same Metal.

2. Then find its Weight according to the Proportion of the Metals, by the last Problem, and it's done.

**Example.** If an Iron Bullet 4 Inches Diameter weigh 9 Pounds; what is the Weight of a Leaden Bullet 6 Inches Diameter? Answer, Pounds 45.45 parts. For it is thus wrought;

1. As 4 to 6, so is 9 to 13.5; and so is 13.5 to 20.2?

○

and

and so is 20.2 to Pounds 30.3 Tenths, if it had be Iron; but being it's Lead; say,

2. As 2 is to 3, so is 20.3 to Pounds 45.45 per the Weight being Lead.

*V. The Use of Gunter's Scale in Navigation; and fir in Plain Sailing.*

**CASE I.**

*Course and Distance sail'd given; to find the Difference Latitude and Departure from the Meridian.*

*To do this, the Proportions are these;*

1. **A**S Radius is to the Distance, so is the Sine of the Course to the Departure from the Meridian.

2. As Radius is to the Distance sail'd, so is the Sine Complement of the Course to the Difference of Latitude.

*Note, The Radius, according to the Nature of the Proportion, may be any of these;*

8 Points	} on the Line of	{	Sine Rumbs.
4 Points			Tangent Rumbs.
90 Degrees			Sines.
45 Degrees			Tangents.

And for Conveniency, that each Proportion may stand in one Line.

Let S.	} stand for	{	Sine.
S. c.			Sine Complement.
T.			Tangent.
T. c.			Tangent Complement.
Cr.			Course.
Dist.			Distance sail'd.
Diff. Lat.	}	{	Difference of Latitude.
Dep.			Departure from the Meridian.

*Example. If a Ship sails S. W. by S. 104 Minutes from Latitude 1 d. 45 m. North; I demand what Latitude she is in, and her Departure from the Meridian?*

As





**Examp.** Suppose a Ship sails N. N. E. from the Latitude of 2 d. 15 m. South, and then, by Observation, is in Latitude 1 d. 22 m. North; What is her Distance sail'd, and Departure from the Meridian?

	d.	m.	
Latitude departed from	2	15	South.
Latitude by Observation	1	22	North.
Added, gives the Difference of Latitude 3 37			

The Difference of Latitude 3 d. 37 m. reduc'd into Minutes by multiplying by 60, is 217 Minutes: Then,

As S. 6 Points is to 27 M. so is S.  $\left\{ \begin{smallmatrix} 8 \\ 2 \end{smallmatrix} \right\}$  Points to  $\left\{ \begin{smallmatrix} 234 \text{ Dist.} \\ 90 \text{ Dep.} \end{smallmatrix} \right\}$

**CASE III.** Course and Departure from the Meridian given to find the Distance and Difference of Latitude.

This is perform'd by these Proportions.

As S. is to the Cr. Dep. so is  $\left\{ \begin{smallmatrix} \text{Radius} \\ \text{S.c. Cr.} \end{smallmatrix} \right\}$  to the  $\left\{ \begin{smallmatrix} \text{Distance} \\ \text{Diff. Lat.} \end{smallmatrix} \right\}$

**Examp.** If a Ship sails S. E. by E. from 1 d. 10 m. North Latitude, till her Departure be 92 Minutes; What is her Distance Sail'd, and Latitude she is in?

As S. 5 Points is to 92 m. so is S.  $\left\{ \begin{smallmatrix} 8 \\ 3 \end{smallmatrix} \right\}$  Points to  $\left\{ \begin{smallmatrix} 110 \text{ the Dist.} \\ 61 \text{ the dif. lat.} \end{smallmatrix} \right\}$

**CASE IV.** Distance and Difference of Latitude given; to find the Course and Departure from the Meridian.

The Proportions are these;

1. As the Distance Sail'd is to Radius, so is the Difference of Latitude to the Sine Complement of the Course.

2. As the Radius is to the Distance Sail'd, so is the Sine of the Course to the Departure from the Meridian.

**Examp.**

**Example.** Admit a Ship sails South Westward 98 Leagues from the Lizard, in Latitude 50 d. 10 m. North; and then by Observation, is in 46 d. 40 m. North Latitude; What is her Course and Departure from the Meridian?

	d.	m.
Latitude departed from	50	10 North.
Latitude by observation	46	40 North.

The Difference of Latitude — 3 30 or 70 Leag.

1. As 98 Leagues is to S. 90d. so is 70 Leagues to 45d. 30 m. whose Complement 44d. 30m. is the Course from the South Westward; that is, S.W. nearest: Then.

2. As S. 90d. is to 98 Leagues, so is S. 44d. 30m. to 38. Leagues, the Departure from the Meridian.

1. By Gunter with Compasses.

1. The Extent from 98 Leag. (in the *Line of Numbers*) to 90 Degrees (in the *Line of Sines*) will reach the same way from 70 Leag. (in the *Line of Numbers*) to 45 deg. 30 min. (in the *Line of Sines*) which being subtracted from 90 deg. leaves 44 deg. 30 min. for the Course.

2. The Extent from 90 Degrees (in the *Line of Sines*) to 98 Leagues (in the *Line of Numbers*) will reach from 44 Degrees 30 Min. (in the *Line of Sines*) to 68 Leagues (in the *Line of Numbers*) which is the Departure from the Meridian.

2. By Sliding Gunter.

1. Bring 98 Leagues (in the *Line of Numbers* and on the middle Piece) against 90 deg. (in the *Line of Sines*, on the outside Piece;) then right against 70 Leag. on the first is 45 d. 30m. on the second, which is the Complement of the Course.

2. And as it now stands against 44 d. 30 m. (in the *Line of Sines*, on the outside Piece) is 68 Leag. (in the *Line of Numbers*, on the middle Piece,) which is the Departure as before.

**CASE V.** *Distance and Departure given; to find Course and Difference of Latitude.*

*The Operations are as follow.*

1. **A**S the Distance Sail'd is to Radius, so is the Departure to the Sine of the Course.

2. As Radius is to the Distance Sail'd, so is the Complement of the Course to the Difference of Latitude.

*Examp. A Ship runneth 354 Minutes North East from 1 d. 19 m. South Latitude, until her Departure 150 Minutes: What is her Course and Latitude she is in?*

1. As 354 min. is to S. 90 deg. so is 150 min. to 25 deg. the Course North Eastward, or N.N.E.  $\frac{3}{4}$

2. As S. 90 deg. is to 354 minutes, so is S. 65 grees to 323 minutes, the Difference of Latitude.  
d. m.

Latitude departed from, is ————— 1 19 S.

The Difference of Latit. 323 min. or ————— 5 23

Subtract, gives Latit. the Ship is in ——— 3 04 N.

**CASE VI.** *Difference of Latitude and Departure given to find the Course and Distance.*

*To do this, these are the Proportions,*

1. **A**S the Difference of Latitude is to the Departure from the Meridian, so is Radius to the Tangent of the Course.

2. As the Sine of the Course is to the Departure from the Meridian, so is Radius to the Distance Sail'd.

*Examp. Sailing between the North and the West, from 1 d. 59 m. South Latitude, and then arriveth at another Port which is in 3 d. 8 m. North Latitude, and is 209 Minutes to the Westward of the first Port; I demand the Course and Distance from the first Port to the second?*

Latitude



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Latitude of the first Port ————— 1 59 South.  
 Latitude of the second Port ————— 3 8 North.

Added, gives Diff. Latitude ————— 5 7 or 307 m.

1. As 307 min. is to 209 min. so is Tang. 45 d. to Tang. 34 d. 15 m. The Course North Westward, or N.W. by N. nearest.

2. As S. 34 degrees 15 minutes is to 209 minutes, so is S. 90 degrees to 370 minutes the Distance between the Ports.

## 1. By Gunter with Compasses.

1. The Extent from 307 min. to 209 min. (in the Line of Numbers) will reach from 45 deg. (in the Line of Tangents, that now being the Radius) to 34 deg. 15 min. (in the same Line of Tangents) which is the Course from the Meridian.

*Note*, If the { Diff. Lat. } be greatest, the Cr. is { less } than  
 { Depart. } { more }

45 deg. from the Meridian.

2. The Second Cannon for the distance is wrought, as in Case the 3d.

## 2. By Sliding Gunter.

1. In this Case, to put in the middle piece, that a Tangent Line may slide by and next a Tangent Line, also Numbers against Numbers: Then bring 307 min. (in the Line of Numbers on the middle piece) against 209 min. (in the Line of Numbers on the outside piece;) then against 45 deg. (in the Line of Tangents on the middle piece) is 34 deg. 15 min. (in the Tangents on the outside piece) which is the Course requir'd.

2. For the Distance, the manner of working is the same as hath been shew'd in Case 1st, 2d, 3d.

*To resolve a Traverse by Gunter.*

Example 1.

A Ship in Latitude 40 Degrees North, and Longitude 3  
O 4 Degrees

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*Degrees 24 Minutes West; she sails first S. E. by S. 68 Minutes, then S. W. by W. 55 Minutes, and then W. N. W. 75 Minutes; I demand the Course and Distance from the first Place of Departure, and what Latitude and Longitude she is now in?*

To do this, first find the Difference of Latitude and Departure from the Meridian for each several Course, as directed in *Case first of Plain Sailing.*

2. Collect the several Differences of Latitude, whether North or South, into one Sum; and in like manner, the several Departures, either East or West; taking the Difference of the Northing and Southing for the Difference of Latitude; and the Difference of the Easting and Westing, for the Departure from the Meridian.

3. Having now the Difference of Latitude, and the Departure known, the Course and Distance may be found by the *6th Case of Plain Sailing.*

4. The Difference of Longitude, may be found by this Proportion;

As the Sine Complement of the middle Latitude is to the Departure from the Meridian, so is Radius to the Difference of Longitude. See the Work following.

Prs. M.

- |                                       |   |
|---------------------------------------|---|
| 1 Course. As S. 8 Points to 68' so S. | { 3 to 38 Easting.<br>5 to 57 Southing.     |
| 2 Course. As S. 8 Points to 55' so S. | { 5 to 46 Westing.<br>3 to 30.6 Southing.   |
| 3 Course. As S. 8 Points to 75' so S. | { 6 to 69.5 Westing.<br>2 to 28.8 Northing. |
- Courses.

Courses.	Diff.	Diff. Lat.		Departure.	
		North	South.	East	West.
1. S. E. by S.	68		57	38.	
2. S.W.byW.	55		30.6		46.
3. W.N.W.	75	28.8			69.5
			87.6		115.5
			28.8		38.
	Diff.	Lat.	58.8		77.05
Dep. Then.					

m. m. d. d. m.

3. As 58.8 is to 77.5, so is T. 45 to T. 52.50. the Course from the South towards the West; that is S.W.  $\frac{1}{2}$  W. almost. And again,

As S. 52 d. 50 m. is to 77.5, so is S. 90 d. to 97. m. the Distance from the first Place of Departure.

d. m.  
Latitude departed from ———— 40 00 North.  
The Difference of Latitude 58.8 or 0 59 Southerly  
Subtract, gives the Lat. the Ship is in 39 01 North.  
Therefore the middle Latitude is 39 30  
Subtracted from ———— 90 00  
Makes Comp. of middle Latitude 50 30

4. As S. 50 d. 30 m. is to 77.5, so is S. 90 d. to 100 m. the difference of Longitude. d. m.  
The Longitude departed from is ——— 5 24 West.  
The difference of Longit. 100 m. or 1 40 Westing.  
Added, gives the Long. the Ship is in 7 14 West.

Examp. 2. A Ship in Latitude 41 d. 30 m. North, and Longitude 10 d. 20 m. East, sails these several Courses and Distances, viz. S. E. by S. 52 Minutes, then S. S. W. 63 min. E. by N. 47 m. N. by E.  $\frac{1}{2}$  E. 35 m. N. N. W.  $\frac{1}{4}$  W. 47 m. W. N. W. 73 m. I aemand the Course

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Course and Distance from the first Place of Departure, also the Latitude and Longitude she is in?

1. For the doing of which, observe the Work following:

	M.	Point	M.
1	52	3	28.8 E
		5	43.2 S
2	63	2	24.2 W
		6	58.5 S
3	47	1	46.2 E
		7	9.2 N
Courfe. As S. 8 Po. is to < 10.2 E > , fo is S. < 10.2 E > to			
4	35	6	36.6 N.
		2	20 W
5	47	5	42.5 N
		6	68 W
6	73	2	28 N

2. Then collect the several Northings, Southings, Eastings and Westings into one, as here you see in the Table following; whereby you will have the difference of Latitude and Departure from the Meridian.

Courses.	Dist.	Diff. Lat.		Departure.	
		North.	South.	East.	West.
1. S. E. by S.	52		43.2	28.8	
2. S. S. W.	63		58.5		24.2
3. E. by N.	47	9.2		46.2	
4. N. by E. $\frac{1}{2}$ E.	35	33.6		10.2	
5. N. N. W. $\frac{1}{4}$ W.	47	42.5			20.
6. W. N. W.	73	28.			68.
		113.3	101.7	85.2	112.2
		101.7			85.2
		Diff. Lat. 11.6		Departure 27.0	

3. Now having the Diff. Lat. and the Departure known, the Course and Distance is thus found;

m,



m. m. d. d. m.

As 11.6 is to 27, so is T. 45 to T. 66.40: The Courle from the North Westward, or, W.N.W. nearest.

Here observe the Courle is more than 45 degrees from the Meridian, because the Departure is more than the Difference of Latitude; according to the Note in the 6th Case of Plain Sailing: Then for the Distance, say,

d. m. m. d. d. m.

As S. 66.40 is to 27, so is S. 90 to 29.5: The Distance from the first Place of Departure.

	d.	m.	
Latitude departed from	41	30	North.
The Diff. Lat. 11.6 m. or,		12	North.
Added, gives the Latit. the Ship is in	41	42	North.
And the middle Latitude is	41	36	
Subtracted from	90	00	
Leaves Compl. of middle Latitude	48	24	

4. Then to find the Difference of Longitude; say,

As S. 48 d. 24 m. is to 27 m. so is S. 90 d. to 36 m. the difference of Longitude.

	d.	m.	
The Longitude departed from, is	10	20	East.
The Difference of Longit. 36 m. or,		36	West.
Subtract, gives the Longit. the Ship is in	09	44	East.

Secondly in Mercator's Sailing.

### CASE I.

The Latitude and Longitude of two Places given; to find their Course and Distance.

Example. I demand the Course and Distance from the Lizard to Barbadoes, their Latitudes and Longitudes being suppos'd to be as follows:

d. m.

	d. m.		d. m.
<i>Lizard</i>			
<i>Barbadoes</i>			
Lat. { 50. 10 North }		Long. { 5. 24 W. }	
Lat. { 13. 10 North }		Long. { 57. 24 W. }	
The diff. Latitude 37. South.		diff. Long. 52. W.	
60		60	

Minutes 2220

Minutes 3120

To Answer this Question, the Proportions are these ;

1. As the Meridional Difference of Latitude is to the difference of Longitude, so is Radius to the Tangent of the Course.

2. As the Sine Complement of the Course is to the Difference of Latitude, so is Radius to the Distance of the two Places.

The Meridional Difference of Latitude is thus found ; Extend the Compasses in the Meridian Line from one Latitude to the other ; that Extent measured in the *Equinoctial Line* (the Line next joining to the *Meridian Line*) gives the Meridional Difference of Latitude.

Thus the Extent from Lat. 50 d. 10 m. to Lat. 13 d. 10 m. in the first, being measured on the latter, is 45 d. or 2700 m. the Meridional Difference of Latitude : Then it is.

As 2700 m. is to 3120 m. } so is T. 45 to T. 49. The  
Or, As 45 d. is to 52 d. }  
Course from the South westward, or S. W. 4 deg. west-  
erly. And again.

As S. 41 is to 2220 m. so is S. 90 d. to 3390 m.

Or, As S. 41 d. is to 37 d. so is S. 90 d. to 56 d. 30 m.  
so that the distance is 56 d. 30 m. or 3390 minutes.

### CA SE II.

*Both Latitudes and Courses given ; to find the Distance and Difference of Longitude.*

*The Proportions are these*

1. **A**S the Sine Complement of the Course is to the difference of Latitude, &c. as before in the 2d. Case

*Case of Plain-Sailing, to find the Distance and the Departure from the Meridian.*

2. As the Sine Complement of the middle Latitude is to the Departure, so is Radius to the Difference of Longitude.

Or thus; As the Sine Complement of the Course is to the Meridional Difference of Latitude, so is the Sine of the Course to the Difference of Longitude.

*Example. Admit from the Lizard in 50 d. 10 m. North Latitude, and Longitude 5 d. 24 m. West, we made (when Lee-way Variation allow'd for) our Course to be South 39 d. Westerly, and then by Observation is in Latitude 45 d. 11 m. North; I demand her Distance run, and what Longitude she is in?*

Latitude Departed from	50 d 10 m.	North.
Latitude by Observation	45 11	North:
Subtract, is the diff. of Latitude	4 59	Southerly,
	60	

Minutes 299

The middle Latitude; is	47 d. 40 m.
Subtract from	90
Leaves Com. of the middle Lat.	42 20

1. As S. 51 d. is to 299 m. so is S.  $\left\{ \begin{smallmatrix} 90 \\ 39 \end{smallmatrix} \right\}$  d. to  $\left\{ \begin{smallmatrix} 385' \text{ diff.} \\ 242' \text{ dep.} \end{smallmatrix} \right\}$

As S. 42 d. 20 m. is to 242 m. so is S. 90 d. to 358 m. the difference of Longit: Or thus; The Extent from 50 d. 10 m. to 45 d. 11 m. in the Meridian Line, measured in the equal Parts, is 7 d. 20 m. or 440 m. for the Meridional Difference of Latitude: Then,

As S. 51 d. is to 440 m. so is S. 39 d. to 358 m. Or thus;

As 299 m. is to 242 m. so is 440 m. to 358 m. as before, which is the Difference of Longitude,

The

	d.	m.
The Longitude departed from —————	5	24 West.
The Difference of Longit. 358 m. or, ———	5	58 West.
Added, gives the Longit. the Ship is in—	11	22 West

## CASE III.

*Both Latitudes, and Distance given; to find the Course and Difference of Longitude.*

*To perform this, the Proportions are these.*

1. **A**S the Distance is to Radius, so is the Difference of Latitude to the Sine Complement of the Course; as in the 4th Case of Plain-Sailing, by which also you may find the Departure or Meridional Distance
2. As the Sine Complement of the middle Latitude is to the Departure, so is Radius to the Difference of Longitude: Or thus;

As the Difference of Latitude is to the Departure, so is the Meridional Difference of Latitude to the Difference of Longitude,

Example. *A Ship in Latitude 46 d. South, and Longitude 1 d. 15 m. West, sails 100 Leagues North Eastward, and then by Observation is in Latitude 42 d. South; I demand her Course, Departure, and Longitude she is in?*  
 Latitude departed from, is 46 d. South.  
 Latitude by Observation, is 42 d. South.

Subtract, gives the diff. lat. 4 d. or 80 Leagues.

The middle Latitude, is — 44 d. whose Comp. is 46 d.

1. As 100 Leagues is to S. 90 d. so is 80 Leag. to S. 53 deg. 15 m. the Complement of the Course; so that the Course is 36 deg. 45 min. North Eastward, or N.E. by N.  $\frac{3}{4}$  E. And then again,

As S. 90 d. is to 100 Leag. so is S. 36 d. 45 m. to 60 Leag. the Departure from the Meridian.

2. As S. 46 d. is to 60 Leag. so is S. 90 d. to 83 leag. the difference of Longitude: Or thus, The Extent from



46 d. to 42 d. on the Meridian Line, makes 5 d. 30 m. or 100 Leag. (on the equal Parts) which is the Meridional Difference of Latitude: And then it is,

As 80 Leag. is to 60 L. so is 100 L. to 83 L. } diff. long.  
Or, as 4d. is to 3d. so is 5d. 30m. to 4d. 9 m.

Longitude departed from; is ——— 1 d. 15 m. *West*.

The Diff. of Longitude 83 Leag. or — 4 d. 9 m. *East*.

Subtract, gives Longitude Ship is in 2 d. 54 m. *East*.

### CASE IV.

*Both Latitudes and Departure given; to find the Course, Distance, and Difference of Longitude.*

1. **T**HE Course and Distance is found by the 6th Case of Plain-Sailing.

2. The Difference of Longitude is found, as in the last Case, or any other Case in Mercator.

Example, *A Ship in Latitude 33 d. North, and Longitude 178 d. West, she sails South Westward until she be departed from the Meridian 58 Leagues, and then she is in Latitude 28 d. 36 m. North; I demand her Course, Distance, and what Longitude she is in?*

Latitude departed from ——— 33 North.  
Latitude she is in ——— 28 36 North.  
The difference of Latit. is ——— 4 24 or, 88 Leagues.

The middle Latitude, is ——— 30 48 the Com. 59. 12

1. As 88 Leagues is to 58 Leag. so is T. 45 d. to T. 33 d. 20 m. which is the Course *South Westerly*, or S.W. by S.

2. As S. 33 d. 20 m. is to 58 Leag. so is S. 90 d. to 105 Leag. the distance sail'd.

3. The Meridional difference of Latitude, is 5 d. 10 m. or 103 Leagues.

4. As { S. 59°. 12' } is to 58 Leag so is { S. 90 deg. } to 103 leag. } to

67 Leagues, the difference of Longitude.

	d.	m.
5. Longitude departed from, is	178	0 West.
The Diff. of Long. 67 Leag. or	3	21 West.
Added, and the Sum is,	181	21
Which subtract from	360	0
Remainder, is Long. the Ship is in	178	39

## CASE V.

*One Latitude, Course and Distance given; to find the other Latitude and Difference of Longitude.*

1. **T**HE Difference of Latitude, and Departure from the Meridian, is found by the first Case of Plain Sailing; and consequently the other Latitude.

2. The Difference of Longitude, is found as before, in the 2d or 3d Case of Mercator.

*Example. If a Ship sails S.E. by S. 120 Leagues, from a Port in Latitude 53 d. 30 m. North, and Longitude 2 d. 15 m. West; what Latitude and Longitude is she now in?*

1. As S. 8 Pts to { 5 } Pts to { 100 Leag. Diff. Lat.  
120 Leag. so is S. { 3 } { 67 Leag. Departure.

	d.	m.
2. Latitude departed from, is	53	30 North.
The diff. of Lat. 100 Leag. or	5	
Subtract, gives Lat. she is in	48	30 North.
And the middle Latitude, is	51	Comp. 39d.

3. The Meridional Diff. Lat. is 8d. or 160 Leagues.

4. As { S. 39 d. } is to 67 Leag. so is { S. 90 d. } to  
106 Leag. the Difference of Longitude.

d. m.

	d.	m.	
5. Longitude departed from, is	2	15	West.
The Diff. Long. 106. 5 Leag. or	5	20	East.
Subtract, gives the Longit. she is in	3	05	East.

CASE VI.

*Sailing in a Parallel; to find the Difference of Longitude.*

*To do this, the Proportion is thus;*

**A**S the Sine Complement of the Parallel or Latitude is to the Distance sail'd (*East. or West.*) so is Radius to the Difference of Longitude.

*Example. If a Ship sails West 390 Minutes, in the Latitude of 50 d. 10 m. and departs from the Longitude of 2 d. 15 m. East; I demand what Longitude the Ship is now in?*

1. As S. 39 d. 50 m. is to 390 m. so is S. 90 d. to 610 m. the Difference of Longitude.

	d.	m.	
2. Longitude departed from	02	45	East.
The Diff. Long. 610 m. or	10	10	West.
Subtract, gives Long. she is in	07	25	West.

CASE VII.

*The Difference of Longitude given of two Places in one Parallel or Latitude; to find their Distance in that Parallel.*

*The Proportion is thus.*

**A**S Radius is to the Difference of Longitude, so is the Sine Complement of the Latitude to the Distance in that Parallel.

*Example 1. Suppose Cape Vincent in Portugal, and Cape Henry in Virginia, both in the Latitude of 37 deg. North; their Longitude suppos'd to be as follows;*

P

Cape

Cape St. Vincent. } Longitude. } 8 deg. 25 min. West.  
 Cape Henry. } } 74 deg. West.

*What is their Distance in their Parallel?*

d. m. d. m.

1. Latitude is, 37N.

Longitudes are, } 8 25 West.  
 } 74 West.

Take from 90

Comp. Latit. 53 The Diff. Longitude is 65 35 West.  
 d. d. m. d. m.

2. As 5.90 is to S. 53, } 65.35 } to } 52 30 } the  
 so } 3935m. } } 3150m. }

Distance required.

*Example 2. Suppose Two Ships under the Equinoctial, and 100 Leagues asunder, and each sails North till both come into Latitude 60 d. How far are they now asunder?*

*Answer 50 Leagues. For it is,*

*As S. 90 deg. is to S. 30 deg. so is 100 Leagues to 50 Leagues, the Distance requir'd.*

### CASE VIII.

*To find how many Minutes or Miles make a Degree of Longitude, make in any Parallel of Latitude.*

*The Rule.*

**A**S Radius is to the Complement of the Latitude, so is 60 Minutes (a Degree in the Equinoctial) to the Minutes making a Degree of Longitude requir'd.

*Example In the Latitude of 50 d. I demand how many Minutes (of Easting or Westing) make a Degree of Longitude? Answer, 38½ Minutes. For it is,*

d. d. m. m.

*As S. 90 is to S. 40, so is 60 to 38.5 or 38 and a half to make one Degree of Longitude in Latitude 50 d.*

*Tbis.*



*This may be done by the Plain Scale, thus;*

Take the given Latitude from the Chords, and measure it on the Line M. L. (which is Miles of Longitude) sheweth your desire: So here take 50 deg. from the Chords, and measure on the Scale M. L. it sheweth 38 and a half min. as before.

## VI. *The Use of Gunter's Scale in Astronomy.*

**PROB. I.** *The Sun's Place in the Ecliptick, and his greatest Declination given; to find his Right Ascension and present Declination.*

*To perform this, these are the Proportions;*

1. **A**S Radius is to the Sine Complement of the Sun's greatest Declination, so is the Tangent of his Longitude (from the nearest Equinoctial Point) to the Tangent of his Right Ascension (from the said Point.)

*The Names and Characters of the 12 Signs.*

♈ Aries,	♎ Libra,
♉ Taurus,	♏ Scorpio,
♊ Gemini,	♐ Sagittarius,
♋ Cancer,	♑ Capricornus,
♌ Leo,	♒ Aquarius,
♍ Virgo,	♓ Pisces.

**Note 1.** The Sun's greatest Declination is 23 Degrees 30 Minutes.

2. The beginning of ♈ and ♎ are the Two Equinoctial Points.

3. This Proportion above, finds the Sun's Right Ascension only when he is in the first Quarter of the Ecliptick; that is, ♈, ♉, or ♊: But when he is in the second Quarter, ♋, ♌, or ♍, subtract it from 180 deg. and when in ♎, ♏, or ♐, add it to 180 Degrees: And

n the last Quarter,  $\wp$ ,  $\text{m}$ , or  $\text{x}$ , subtract (what's found by this Operation) from 360 deg. so will you have the Sun's Right Ascension from  $\gamma$  (for any Place of the Ecliptick desired).

2. As Radius is to the Sine of the Sun's Longitude from the nearest Equinoctial Point, so is the Sine of his greatest Declination to the Sine of his present Declination.

*Note,* The Sun being in  $\gamma$ ,  $\delta$ ,  $\Pi$ ,  $\text{e}$ ,  $\Omega$ , or  $\text{m}$ , his Declination is North, but in  $\text{z}$ ,  $\text{m}$ ,  $\text{f}$ ,  $\wp$ ,  $\text{m}$  or  $\text{x}$ , it's South.

*Example.* When the Sun's place in the Ecliptick is  $\delta$  24 d. 15 m. What's his Right Ascension and Declination?

The Sun being in  $\delta$  24 Degrees 15 Minutes, his Longitude from the nearest Equinoctial Point (being now the beginning of  $\gamma$ ) is 54 Degrees 15 Minutes. And the Complement of his greatest Declination always is 66 Degrees 30 Minutes. Then it follows;

1. As S. 90 Degrees is to S. 66 Degrees 30 Minutes, so is T. 54 Degrees 15 Minutes, to T. 51 Deg. 50 Min. the Sun's Right Ascension (from the beginning of  $\gamma$ ) requir'd.

1. *By Gunter, with Compasses.*

The Extent from 90 Degrees to 66 Degrees 30 Minutes in the *Line of Sines*, will reach in the *Line of Tangents*, from 54 Degrees 15 Minutes, to 51 Deg. 50 Min. the Right Ascension.

2. *By a Sliding Gunter.*

1. Let the middle Piece be so put in, that Sines may slide against Sines, and Tangents against Tangents.

2. Then bring 90 deg. in Sines (on the out-side Piece) against 66 deg. 30 min. in Sines (on the middle Piece) then against 45 deg. 15 min. in Tangents (on the second Piece) is 51 deg. 50 min. in Tangents (on the outside Piece) the Right Ascension as above.

+

This

This Proportion being to be wrought on Sines. and Tangents jointly, I thought it necessary to express the manner of its Operation on both sorts of Gunters, that the Learner might see how it agrees with the General Rule given at the beginning of this Discourse of the Gunter; but shall wave it in the rest, and only write the Proportions in Words and in Figures, according to the particular Example; as here follows for the Sun's Declination in the foregoing Example.

2. As S. 90 deg. is to S. 54 deg. 15 min. so is S. 23 deg. 30 min. to S. 18 deg. 52 min. the Sun's Declination North.

**P R O B. II.**

*The Latitude of a Place, and the Sun's Declination given; to find his Amplitude, and the Ascensional Difference; and consequently his Rising or Setting, and the Length of the Day or Night.*

*To perform this Problem, the Proportions are these;*

1. **A**S the Sine Complement of the Latitude, is to Radius, so is the Sine of the Sun's Declination to the Sine of his Amplitude.

*Note,* The Amplitude and Declination are always of one kind, that is, both North or both South.

2. As Radius is to the Tangent of the Latitude, so is the Tangent of the Sun's Declination to the Sine of his Ascensional Difference.

*Note 1.* The Ascensional Difference (being reduced into Time, by allowing 15 deg. for one hour, and then) added to, and subtracted from 6 hours, the one is Sun-rising, the other is Setting.

2. If Latitude and Declination are both North, or both South, the Sun riseth before, and sets after 6 of the Clock; but if one be North, and the other South, the contrary.

3. If the Rising and Setting be doubled severally, the first is the Length of the Night; and the latter the Length of the Day.

4. By this Problem were the Tables of Amplitudes, and Semidiurnal Arches, &c. calculated.

**Example.**

*Latitude 51 deg. 32 min. North, and the Sun's Declination 23 deg. 30 min. North; I demand his Amplitude and Ascensional Difference? Also his Rising, Setting, Length of the Day and Night.*

	d.	m.		d.	m.
<i>Ans.</i> His Amplitude	39	50	Ascens. Diff.	33	10
Sun-setting hour	8	13	length of Day	16	26
Sun-rising hour	3	47	length Night	7	34

For it is thus,

1. As S. 38 deg. 28 min. is to S. 90 deg. so is S. 23 d. 30 min. to S. 39 deg. 50 min. the Amplitude North, because the Declination is North.

2. As T. 45 deg. is to T. 51 deg. 32 m. so is T. 23 d. 30 m. to T. 18 deg. 40 m. against which, in S. is 33 d. 10 min. the Ascensional Difference; which being reduc'd into Time, is 2 hours 13 minutes, and added to 6 hours, is 8 hours 13 minutes, Sun-setting; which doubled, is 16 hours 26 minutes, the length of the Day.

Again, 2 hours 13 minutes subtracted from 6 hours is 3 hours 47 minutes Sun-rising; which doubled, is 7 hours 34 minutes, length of the Night.

**PROB. III.** *Latitude of a Place, and the Sun's Declination given; to find his Altitude and Azimuth at 6 of the Clock,*

*To solve this Problem.*

1. **A**S Radius is to the Sine of the Latitude, so is the Sine of his Declination to the Sine of his Altitude at 6 of the Clock,



2. As Radius is to the Sine of the Complement of the Latitude, so is the Tangent of the Sun's Declination to the Tangent of his Azimuth (from the East or West) at 6 of the Clock.

*Note;* The Azimuth is from the East at 6 in the Morning, and from the West at 6 in the Afternoon: Northerly in North Latitude, but Southerly in South.

*Example.* In Latitude 51 d. 32 m. North, the Sun's Declination being 23 d. 30 m. North; What is his Altitude and Azimuth at 6 of the Clock.

*Ans.* His Altitude is 18 d. 12 m. and his Azimuth is 15 d. 10 m. Northerly, or 74 d. 50 m. North Easterly or Westerly. For it is thus,

1. As S. 90 d. is to S. 51 d. 32 m. so is S. 23 d. 30 m. to S. 18 d. 12 m. the Altitude at 6 of the Clock.

2. As S. 90 d. is to S. 38 d. 28 m. so is T. 23 d. 30 m. to T. 15 d. 10 m. the Azimuth at 6; that is, 74 d. 50 m. North Easterly in the Morning; but North Westerly in the Evening.

#### PROB. IV.

*Latitude of a Place, and the Sun's Declination given; to find his Altitude, and Hour of the Day when he is East or West.*

*To perform this, the Proportions are these;*

1. **A**s the Sine of the Latitude is to Radius, so is the Sine of the Sun's Declination to the Sine of his Altitude; being East or West.

2. As Radius is to the Tangent Complement of the Latitude, so is the Tangent of the Sun's Declination to the Sine of the Hour from 6 of the Clock, when he is East or West.

*Note 1.* The Sun is East after 6 in the Morning, but West before 6 in the Evening.

2. The Hour found by the last Proportion being re-

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duced into Time (by allowing 15 d. to an Hour) and added to, or subtracted from 6, giveth the Hour of the Day requir'd.

Example. In Latitude 51 d 30 m. North, the Sun's Declination being 23 d. 30 m. North; What is his Altitude? And what time of the Day is it when he is East or West?

Ans<sup>w</sup>. His Altitude is 30 d. 35 m. and the Hour of the Day is  $\left\{ \begin{array}{l} 7 \text{ h. } 21 \text{ m. Morning, when East.} \\ 4 \text{ h. } 39 \text{ m. Evening, when West.} \end{array} \right.$

For it is thus,

1. As S. 51 d. 32 m. is to S. 90 d. so is S. 23 d. 30 m. to S. 30 d. 35 m. the Sun's Altitude being either East or West.

2. As T. 45 d. is to T. 38 d. 28 m. so is T. 23 d. 30 m. to S. 20 d. 15 m. The Hour from 6, which is 1 Hour 21 Minutes, added to 6, is 7 h. 21 m. and subtracted from it, is 4 h. 39 m. the former is the Time when East in the Morning, the latter the Time in the Evening when he is West.

PROB. V. The Sun in the Equator or Equinoctial, (that is, when he hath no Declination) the Latitude of a Place, and his Altitude given; to find his Azimuth, and Hour of the Day.

This Problem is thus effected.

1. A S Radius is to the Tangent of the Latitude, so is the Tangent of the Sun's Altitude to the Sine of the Complement of his Azimuth, from the South in North Latitude; but from the North in South Latitude; Easterly in the Forenoon, and Westerly Afternoon.

2. As the Sine of the Complement of the Latitude is to Radius, so is the Sine of the Sun's Altitude to the Sine of the Complement of the Hour from Noon.

Example. In Latitude 51 deg. 32 min. the Sun having no Declination, and his Altitude being 21 deg. 59 min. in

the

the Forenoon; I demand his Azimuth, and the Hour of the Day,

Ans<sup>w</sup>. His Azimuth is 59 deg. 45 min. South Easterly; and the Hour of the Day is Hour 8 33 min. Morning. For it is thus;

1. As T. 45 d. is to T. 51 d. 32 m. so is T. 21 d. 50 m. to S. 30 deg. 15 min. whose Complement is 59 d. 45 m. the Sun's Azimuth requir'd.

2. As S. 38 deg. 28 min. is to S. 90 deg. so is S. 21 deg. 50 min. to S. 36 deg. 50 min. whose Complement is 53 deg. 10 min. or 3 Hours 23 Minutes; which subtracted from 12, gives 8 Hours 33 Minutes, or 33 min. after 8 of the Clock in the Forenoon; the Time of the Day requir'd,

**PROB. VI.** *Latitude of a Place, Sun's Declination, and his Altitude given; to find his Azimuth, and the Hour of the Day.*

*The Performance of this, is thus;*

1. **T**AKE the Complement of the Latitude, the Complement of the Altitude, and the Sun's Distance from the Pole, (which is his Declination added to 90 d. when the Latitude and Declination is one North, the other South; but both being either North or South, it's the Complement of the Declination (and add them together into one Sum.

2. From half that Sum, subtract, to find the Azimuth the Sun's Distance from the Pole; but to find the Hour the Complement of his Altit. and note the Remainder.

3. To find the Azimuth, you have these two Proportions following.

1. As Radius is to the Sine of the Complement of the Latitude, so is the Sine of the Complement of the Altitude to a 4th Sine. Then again,

2. As that 4th Sine is to the Sine of the half Sum, so

is the Sine of the Remainder to a 5th Sine; against which in versed Sines, is the Sun's Azimuth from the North in North Latitude; but from the South in South Latitude.

4. To Find the Hour, these are the Proportions which follow.

1. As Radius is to the Sine of the Complement of the Latitude, so is the Sine of the Sun's Distance from the Pole to a 4th Sine.

2. As that 4th Sine is to the Sine of the half Sum, so is the Sine of the Remainder to a 5th Sine; against which in Versed Sines, is the Hour of the Day from Noon.

Example. In Latitude 51 Degrees 30 Minutes North, the Sun's Declination being 15 Degrees 10 Minutes North, and his Altitude observed to be 11 Degrees 30 Minutes, I demand his Azimuth, and Hour of the Day?

90d.	90d.	90d.
Latitude — 51.30	North Declinat. 15.10	North Alt. 11.30
Comp. Lat. 38.30	Suns dist. fr. Pole 74.50	Comp. Alt. 78.30
Comp. Alt. 78.30	Comp. Latitude 38.30	
Sun's Dist. 74.50	Comp. Altitude 78.30	
Sum is — 191.50	Sum is — 191.50	
half Sum is 95.55	The half Sum is 95.55	
Remaind. 21.05	Remainder is — 17.25	

Then to find the Azimuth, it is thus;

1. As Sine 90 deg. is to Sine 38 deg. 30 min. so is Sine 78 d. 30 m. to 37 d. 20 m.

2. As Sine 37 d. 20 m. is to Sine 95 d. 55 m. so is Sine 21 d. 5 m. to Sine 36 d. against which, in Versed Sines, is 80 d. the Sun's Azimuth from the North Easterly, if in the Forenoon; but Westerly in the Evening.

*And*



*And to find the Hour of the Day, it is thus;*

1. As Sine 90 d. is to Sine 38 d. 30 m. so is Sine 74 d. 50 m. to Sine 37 d.
2. As Sine 37 d. is to Sine 95 d. 55 m. so is Sine 17 d. 25 m. to Sine 29 d. 40 m. against which, on Versed Sines, is 90 d. 30 m. or 6 Hours 2 Minutes, which is the Hour from Noon, that is, 58 Minutes after 5 of the Clock in the Morning, or 2 Minutes after 6 in the Afternoon.

*The Description and Use of the*

# S E C T O R.

1. **T**HIS Useful Instrument may be of any Length, but is commonly made 1 Foot 18 Inches, or 2 Foot long, to open in a Joynt in the middle, like a *Carpenter's Rule*; one Inch and a half, or more, in breadth, and of any thickness at pleasure, according to the Matter its made of; which may be either *Boxwood, Ivory, Brass, or Silver.*
2. There are two sorts of *Sectors*, known by the Names of *Gunter* and *Foster's Sector*; and are sometimes both put on one Instrument; that is, *Gunter's Sector* on one side of it, and *Foster's* on the other.
3. The Lines of *Gunter's Sector*, are these; *Line of Lines*, mark'd at the end L. *Line of Sines*, mark'd S. *Superficies*, mark'd Sup. *Solids*, mark'd Sol. *Line of Metals*, *Line of Equated Bodies*, *Line of Inscribed Bodies*, &c.
4. The Lines of *Foster's Sector*, are these Five, viz. *Line of Lines*, or *Equal Parts*, *Chords*, *Sines*, *Tangents* and *Secants*; each mark'd at the end with its Name, or first Letter of its Name,

5. All

5. All *Sector-Lines* or *Scales*, meet at the Center of the Head (where the Joint is) at the Left-hand, and from thence are figured towards the Right, each being twice repeated; that is, one on each Leg or side of the *Sector* answering one another.

6. The *Sector* is useful in *Projection*, to reduce, or to make a Scheme to any (possible) Magnitude; in proportion, to work any stated Canon or analogy in *Arithmetick*, *Geometry*, *Trigonometry*, *Navigation*, *Astronomy*, &c. of which I will give a brief Touch, yet so as the Learned may be informed how to apply it further.

1. *The Use of the Sector Lines for Projection.*

IN *Projections* it's often required to enlarge, or diminish the Scale, that the Draught designed may be of its desired Magnitude; in doing of which, are used *Lateral* and *parallel Distances*, or *Extents* of the *Compasses*. And to avoid a needless laying over the same things, take once for all, what is meant by a *Lateral* and a *Parallel Distance*, or *Extent of the Compasses*.

1. A *Lateral Distance* (in any Line or Scale) is the Extent or Distance (taken along the length of the Line) from the beginning thereof to any Number (therein) desired.

As for Example: The *Lateral Sine* of 30d. is the Distance of 30 from the beginning of the *Line of Sines* and so is it in the *Line of Equal-parts*, *Chords*, *Tangents*, *Secants*, &c.

2. A *Parallel Distance* (in any Line or Scale on the *Sector*) is the Extent or Distance (taken across) from any Number in any Line on one Leg of the *Sector*, to the like Number in the like Line on the other Leg.

Or, the nearest Distance from any Number on one Leg (taken across) to the like Line on the other Leg.

As for Example: The *Parallel Sine* of 30 d. is (supposing the *Sector* open'd to any Angle) the Distance from

from 30 in the *Line of Sines* on one Leg, to 30 in the *Line of Sines* on the other Leg.

Or, the nearest Distance from 30 in the *Line of Sines* on one Leg to the *Line of Sines* (that is to say, the Line issuing from the Center of the Joint or Head) on the other Leg is the *Parallel Sine* of 30d. In like manner is it done in any other Line.

This being understood, the enlarging or diminishing of any of the Lines; or the finding a Chord, Sine, Tangent or Secant, to any proposed Radius will not be difficult; yet for the Learner's further Satisfaction, take a General Rule.

*To find a Chord, Sine, Tangent or Secant, &c. to any Radius (greater or lesser) proposed.*

The General Rule is thus;

1. Take the proposed Radius in the Compasses, and make it a Parallel on the Sector in the Radius of any one Line; that is, open the Sector till the proposed Radius (in the Compasses) be a *parallel Chord* of 60d. in the *Line of Chords*; or a *parallel Sine* of 90d. in the *Line of Sines*; or a *parallel Tangent* of 45d. in the *Line of Tangents*, or a *parallel Secant* of 0d. in the *Line of Secants*; for the Chord of 60, Sine of 90, Tangent of 45, and Secant of 0d. are equal, and each equal to Radius.

2. The Sector being kept at that open'd Distance or Angle, any Parallel Distance in any Lines will be a Lateral Distance on a like Line to the proposed Radius: that is, a Parallel-Chord of 10, 20, 30, &c. is the Chord of 10, 20, 30, &c. to the proposed Radius; also, a Parallel Sine, Tangent, and Secant of 20, 30, 40, &c. is the Sine, Tangent and Secant of 20, 30, 40, &c. to the fore said Radius.



2. *The Use of the Sector in working Proportions.*

**S**UPPOSING the Learner understands how to take a Lateral Distance on the Line of Lines, otherwise called Equal parts, on the Chords, Sines, &c. And to apply them parallel in any Line on the Sector; the working of any Proportion is thus;

*A General Rule to work by the Sector.*

1. Take the 2<sup>d</sup> Term Lateral, that is, from the beginning of the Line to the proposed 2<sup>d</sup> Term, and opening the Sector, apply that extent Parallel, that is, across it, in the 1<sup>st</sup> Term, there stay the Sector at that Parallel Extent.

2. Then the Parallel Distance taken in the 3<sup>d</sup> Term, and measured laterally gives the 4<sup>th</sup> Term sought for or requir'd.

Or briefer thus; As the Lateral 2<sup>d</sup> Term to the Parallel 1<sup>st</sup> Term, so is the Parallel 3<sup>d</sup> Term to the Lateral 4<sup>th</sup> Term.

This one Rule is sufficient for any Proportion whatever, and will appear so by a few Examples.

**PROB. I.** *To multiply by the Line of Lines on a Sector.*

*The Proportion is;*

**A**S 1 to the Multiplicand, so is the Multiplier to the Product.

Example. *What's the Product of 8 multiply'd by 4?*

*The Analogy or Proportion is this;*

As 1 to 8, so is 4 to the Product 32, thus found by the Sector and General Rule aforesaid.

1. In the Line of Lines, that is the Line of Equal Parts, take the 2<sup>d</sup> Term 8 Lateral; that is, from the Center of the Joynt, and the beginning of the Line, to 8 in the same Line.

2. Open



2. Open the *Sector* till you fit the (foresaid Lateral) Distance in the *Compasses* a Parallel in 1 and 1, or 10 and 10; that is, set it over from 10 to 10 at the end of the same Line, and now counted for 1 and 1, the first Term; keep the *Sector* just at that Angle or opening.

3. The Parallel Distance of the 3d Term 4; that is, from 4 to 4, taken a cross from one Leg to the other in the said Line of Lines, and measured Lateral (which is from the beginning of the Line towards the end, and) it's 32, the 4th Term or Product of 8 multiply'd by 4. Or shorter, thus;

As the 2d Term 8 (Lateral taken) to the first Term 10 Parallels set so is the 3d Term (Parallel taken in) 4 to the 4th Term Laterally measured, in 32, the Product as before, Or thus; As the Lateral 4 to the Parallel 10, counted for 1, so is the Parallel 8 to 32, as before.

**PROB. II.** To Divide on the Line of Lines on a Sector.

*The Analogy or Proportion, is this;*

**A**S the Divisor is to 1, so is the Dividend to the Quotient. Or thus;

As the Divisor is to the Dividend, so is one to the Quotient.

**Example.** How many square Yards are in 36 square Feet?  
Answer, 4 square Yards. For it is thus;

As 9 is 1, so is 36 to the Quotient 4, thus to be Wrought by the *Sector*:

As Lateral 1 is to Parallel 9, so is Parallel 36 to Lateral 4, the Yards required.

**PROB. III.** To work the Rule of 3 by the Line of Lines on a Sector: or unto 3 Numbers given; to find a 4th in Geometrical Proportion,

*The*

*The Analogy is,*

**A**S the 1<sup>st</sup> Term is to the 2<sup>d</sup> Term, so is the 3<sup>d</sup> Term to the 4<sup>th</sup> Term requir'd.

**Example 1.** If the Diameter of a Circle be 14 Inches; What's the Circumference? Answer, 44 Inches. For the Proportion is this:

As 7 to 22, so is the Diameter 14 to 44, the Circumference requir'd; by *Settor* thus wrought.

As Lateral 22 to Parallel 7, so is Parallel 14 to Lateral 44; the Circumference of a Circle whose Diameter is 14.

**Example 2.** If a Plank or Board be 15 Inches broad, and 20 Feet long; How many Feet is in it? Answer, 25 Feet. For the Proportion is this:

As 12 to 15 the Breadth, so is 20 the length to 25 Feet, the Content of the Board; and by *Settor*, thus to be wrought;

As Lateral 15 to Parallel 12, so is Parallel 20 to Lateral 25 Feet, the Content of the Plank.

**Example 3.** A Ship being in 42 d. 12 m. North Latitude, she sails N.E. by N. 104 Leagues; I demand the Latitude she is in, and her Departure from the Meridian;

*The Canons or Proportions, are these;*

1. As Radius to the Distance sail'd, so is the Sine of the Course to the Departure from the Meridian.

That is, by the *Settor* thus;

As Lateral 104 Leagues (from the *Line of Lines*) is to Parallel Sine of 90 d. so is Parallel Sine of 33 d. 45 m. the Degrees of the Course from the Meridian to Lateral 58 Leagues (on the *Line of Lines*) the Departure from the Meridian.

*Note,* If 104 Leagues, taken Lateral, be troublesome to fit Parallel in Sine of 90 d. then take its half, or quarter Lateral; And the Answer will be accordingly it  
hal

alf or quarter: As here, if you take 52, the half of 104 Leagues, the Answer would be 29, whose double is 58 for the Departure from the Meridian, as before.

2. As Radius to the Distance sail'd, so is the Sine Complement of the Course to the difference of Latitude.

*By the Sector, thus;*

As Lateral 104 Leagues is to Parallel Sine of 90 d. so is Parallel Sine of 56 d. 15 m. to Lateral 87 Leagues, the Difference of Latitude by which you may find the Latitude the Ship is in, as before in the Use of the Gunter.

Examp. 4. *A Ship sails South Easterly till her Difference of Latitude be 275 min. and the Departure be 412 min. I demand her Course and Distance sail'd.*

The Canons, are these;

1. As the Difference of Latitude is to the Departure, so is Radius to the Tangent of the Course.

*That is, By the Sector thus;*

As Lateral 412 Minutes is to Parallel 275 Minutes so is Parallel Tangent of 45 Degrees (that being Radius now) to Lateral Tangent of 56 Degrees, 15 Minutes, the Course from the Meridian, which makes S. E. by E.

2. As the Sine of the Course is to the Departure, so is the Radius to the Distance sail'd.

*By the Sector, thus;*

As Lateral 412 m. to Parallel Sine 56 d. 15 m. so is Parallel Sine of 90 d. (that now being Radius) to Lateral 495 m. the Distance sail'd.

After this manner may any Proportion be wrought by the Sector, which I leave for the Learner's Exercise.

Q

The

## The Use of the following Tables of Latitude and Longitude.

**L** *Aititude* and *Longitude* are two primary Affections of the Earth: By the help of these two doth the *Geographer* strive to represent the Parts of the Earth, that they may keep symetry and harmony with the Whole.

*Latitude* is an Arch of the Meridian, comprehended between the Equinoctial and a Parallel. But *Longitude* is an Arch of the Equinoctial, intercepted by the Meridian of *London*, and the Meridian of any other Place.

For the exact settling of Latitudes, we have many absolute Helps; but the Longitude of a Meridian is that which hath, and still wearie the greatest Masters of *Geography*.

I have endeavoured to settle the Longitude with as much exactness as possible I could: For I not only calculated according to the Lat. and Merid. Distance of each Place from the Meridan of *London*; which Meridian-Distance I obtained from the exactest *Geographical Charts* extant; but I consulted with the Reckonings of skilful and able Mariners; and when I found any difference, I composed it both according to Art and Reason.

As for instance; I had from skilful and able Mariners, upon their long experience, the Meridian-Distance from *Barbadoes* to the *Lizard*: According to which I have settled the Longitude of all the eminent Places in the *West-Indies*.

And for the settling of the Longitudes of the Places in *East-Indies*, I consulted Observations of Eclipses both Antient and Modern, as in 161 Page of *Hermonicon celeste*, the difference of Meridians between *Goa* and *London*, is 5 h. 48 m. and *Malico* and *London*, is 7 m. 19 m. My Table hath the former of these 6 h. 6 m. and the latter 7 h 23 m. the Differene between my Table, and the former of these Observations is 18 m. and of the latter is 4 m. which Difference may be born withal. If



“ If the Reader considers the Time, being 1664,  
“ with the great Labour and Pains, to my Knowledge,  
“ being then his Servant, the Author bestow'd and ex-  
“ pended in performing this Work, they were then the  
“ best of this Kind.

“ But since that Time there hath been better Helps,  
“ new Discoveries made, and new Places found out ; the  
“ *Corrector*, at the Request of the *Book-seller*, and out of  
“ Respect to the deceased *Author*, but most of all for the  
“ *Publick Good*, hath made such Amendments herein, as  
“ was possible, by comparing the best of *Observations*,  
“ *Tables*, *Charts*, *Maps*, and *Sea-Journals*, he was able to  
“ procure ; so that it may be concluded, these *Tables*  
“ are the truest, or come (in the general) the nearest the  
“ *Truth*, of any extant in our Language ; not that they  
“ are so exact in every particular Place, as to need no  
“ Amendment in Time, but with respect to the present  
“ Helps in 1707, they are so.

“ And now I could wish, that either *Authority* would  
“ order, or that all concern'd in setting forth *Latitude*  
“ and *Longitude Tables*, *Charts* and *Maps*, would mutually  
“ unite in a *Fixed-Meridian* to begin *Longitude* at.

“ For although *Longitude* may begin at any *Meridian*,  
“ yet the Convenience of its beginning at one *Meridian*,  
“ in all our *English Navigation-Books*, *Charts*, would ren-  
“ der the *Study* and *Practice* of *Navigation* much more  
“ pleasant and easy, than now it is : Such various begin-  
“ nings and countings of *Longitudes*, occasioneth some to  
“ *Stumble*, some to *Mistake*, and some to condemn all to  
“ be false, by not considering the several *Meridians* made  
“ use of ; which such a wish'd Union would prevent.

“ But this is not likely to be in my Time, who am so  
“ near the *Grave* ; yet should it be set on foot, while I  
“ am on this side the other World, my best Perform-  
“ ances should not be wanting to promote it, and should  
“ count all my spare Hours from necessary Preparations  
“ for my *Last-End*, well spent in such a *Useful*, and  
“ *Publick Good*.

Note, 1. I do begin the *Longitude* at the Meridian of *London*, and increasing it on both Sides the said Meridian; that is to say, both *Eastward* and *Westward*, and terminate at 180 Degrees.

2. Therefore (according to this Account) all Places on the East-side of the Meridian of *London*, lie in East *Longitude*; and on the contrary, all on the West-side of it, lie in West *Longitude*.

3. If a Ship be in East *Longitude*, sailing to the Eastward, the *Longitude* increaseth; but sailing to the Westward, the *Longitude* decreaseth.

4. And on the contrary, if a Ship be in West *Longitude*, then sailing to the Westward, the *Longitude* increaseth, and sailing to the Eastward, it decreaseth.

5. Take notice, that two Places in the East *Longitude*, the Sun cometh on their Meridian before he cometh on the Meridian of *London*. As, if a Place lie in 15 deg. East *Longitude*, the Sun cometh one Hour, sooner to the Meridian there, than he doth to the Meridian of *London*. If in 30 deg. East *Longitude*, then 2 Hours sooner, if 45 d. three Hours sooner, if 60 d. four Hours sooner, if 75 d. five Hours sooner, if 90 d. six Hours sooner, if 105 d. seven Hours sooner; and so you may reckon for any other *Longitude*. But on the contrary, all those Places that lie in West *Longitude*, the Sun or Star cometh on their Meridian after he is past the Meridian of *London*.

To find the Difference of *Longitude* between any two Places.

IF both Places be in East or in West *Longitude*, subtract the lesser *Longitude* out of the greater, and the Remainder is the Difference of *Longitude*.

If one Place be in East *Longitude*, and the other in West, add both together, and their Sum is the Difference of *Longitude*.

**A TABLE** containing the Chief Harbours, Headlands and Islands in the World; shewing their Latitude and Longitude: Beginning the said Longitude at the Meridian of London.

**The Sea-Coast of Greenland.**

Names of Places.	Latitude.		Longitude	
	D.	M.	D.	M.
<b>H</b> Acluits Headland	79	50	12	10
Fair Foreland	79	15	11	05
Cape Cold, the North end of	79	00	10	32
Charles Isle				
Black Point, South end of it	78	30	12	40
Dear Sound	79	15	13	00
Foul Sound	77	38	13	20
Bell Sound	77	34	13	39
Horn Sound	77	17	14	30
Point Lookout	76	35	16	10
Helies Sound	79	17	22	20
Cape Barcam	78	25	23	32
Cape Blanco	78	00	23	30
Ducks Cove	77	45	23	10
Negro Point				
Hope Island	76	25	26	12
Cherry Island, or Bear Island	74	40	18	18
Ice Point, or Cape Desire	77	40	69	10
Admiralties Island	75	10	60	00
Langeness	74	35	56	00
Cross Point	72	25	56	12
Fretum Burrough	70	00	66	20
Mauritius Isle	69	55	57	00
Cape Candemose	69	25	41	15
Cape Barso	66	00	38	25

Sea-Coasts from *Archangel* to the *Naze* of *Norway*.

Names of places.	Latitude.		Longitude.	
	D.	M.	D.	M.
<i>Archangel</i> —————	64	25	34	58
<i>Cape Grace, or Cape Bona</i> } ————	65	37	37	30
<i>Fortuna</i> —————				
<i>Cape Gallant, or Sweetnose</i> ————	67	41	36	00
<i>Kilduyn Island</i> —————	69	10	32	00
<i>River Kola</i> —————	69	15	31	50
<i>Schartinberg Nefs</i> —————	71	10	24	38
<i>North Cape</i> —————	71	25	22	42
<i>Landen</i> —————	71	08	18	08
<i>Island Sanien</i> —————	69	30	13	15
<i>Warro, or Wercy</i> —————	67	00	07	28
<i>Drenton</i> —————	64	01	08	06
<i>Ransdel</i> —————	63	20	06	52
<i>North Point</i> —————	62	30	03	45
<i>Katts Nefs, or Scutts Nefs</i> } ————	61	54	03	22
<i>South-point</i> —————				
<i>Harla Island, the South end</i> ————	60	14	03	38
<i>Bergen</i> —————	60	10	04	20
<i>Bommel Sound</i> —————	59	30	03	40
<i>Out Seers</i> —————	58	45	03	16
<i>Fedder</i> —————	58	27	04	40
<i>Naze of Norway</i> —————	58	00	06	02

Sea-



Sea-Coasts in the *Sound*.

Names of Places.	Latitude.		Longitude	
	D.	M.	D.	M.
<i>Maerden</i>	58	17	07	58
<i>Long Sound</i>	58	37	08	00
<i>Lagerwick</i>	58	40	08	44
<i>Coperwick</i>	59	10	08	50
<i>Ansloo or Christiana</i>	59	10	09	10
<i>Gotenberg Gat</i>	57	36	12	18
<i>Cape Kol</i>	56	10	12	42
<i>Elsenberg</i>	56	16	12	50
<i>Valsterbore</i>	55	22	13	05
<i>Christianopoli</i>	58	30	14	35
<i>Kalmore</i>	56	45	14	54
<i>Oeland the</i>	56	20	14	59
	57	20	15	30
<i>Stickholm</i>	57	33	14	35
<i>Stockholm</i>	59	00	17	02
<i>Aboe</i>	60	38	19	59
<i>Rasheburg</i>	60	40	21	28
<i>Borgo</i>	60	52	26	10
<i>Pelling Sound</i>	60	30	27	10
<i>Vekelax</i>	60	46	28	18
<i>Wyburgh</i>	61	00	29	26
<i>Cast Rand, or Castrum</i>	60	02	29	47
<i>Narva</i>	59	35	28	50
<i>Revel</i>	59	28	25	18
<i>Nargin Island</i>	59	50	24	35
<i>Sybrichns of Dageroert</i>	59	34	23	11
<i>Arensburg in Oesel Island</i>	58	45	23	42
<i>Parnout</i>	58	22	27	30
<i>Rugen Island</i>	58	00	24	00
<i>Ryga</i>	57	10	24	50
<i>Domefness</i>	58	00	23	00

North Latitude.

East Longitude.

## Sea Coasts in the Sound.

Names of Places.	Latitude.		Longitude	
	D.	M.	D.	M.
<i>Der-Winda</i> _____	57	08	22	43
<i>Der-Memel</i> _____	56	15	21	20
<i>Coningsberg</i> _____	55	05	20	32
<i>Dantzick</i> _____	54	30	19	05
<i>Heel</i> _____	55	00	18	35
<i>Gotland, the North End</i> _____	58	00	19	09
<i>Faro Sound</i> _____				
<i>Gotland Wisby</i> _____	57	28	19	00
<i>Gotland, the South end</i> _____	57	00	18	00
<i>Born Holm</i> _____	55	28	15	06
<i>Camin, or Kamin</i> _____	54	25	15	06
<i>Fasmond, or Rugen</i> _____	55	00	13	40
<i>Stetin</i> _____	54	15	15	40
<i>Straelfond</i> _____	54	30	12	50
<i>Wasmor</i> _____	54	15	12	00
<i>Lubeck</i> _____	54	10	10	06
<i>Copenhagen</i> _____	55	40	12	24
<i>Elsenore</i> _____	56	15	12	17
<i>Amout Island</i> _____	56	45	10	54
<i>Lesen, or Lesnow Island</i> _____	57	05	10	19
<i>The Scaw</i> _____	57	26	10	00

North Latitude.

East Longitude.

The Sea-Coasts of Holland and Flanders, from the Scaw to Calis.

<i>Holy Land, or Heligland Isle</i> _____	54	30	North Latitude.	08	00	East Longitude.
<i>Hambrough</i> _____	54	00		10	00	
<i>Bremen</i> _____	53	50		09	12	
<i>Emden</i> _____	53	34		08	00	
<i>Ameyland</i> _____	53	40		06	40	
<i>Schelling</i> _____	53	25		05	50	
<i>The Fly</i> _____	53	15		05	28	

*The Sea Coasts of Holland and Flanders, from the Schaw to Calis.*

Names of Places.	Latitude.		Longitude	
	D	M.	D.	M.
The Texel	53	10	05	12
Amsterdam	52	39	05	00
Rotterdam	51	55	04	20
Antwerp	51	17	04	32
The Brill	52	00	04	14
Middleburg in Zealand	51	48	04	00
Sluys	51	28	03	57
Ostend	51	30	03	05
Dunkirk	51	18	02	25
Calis	51	00	01	52

North Latitude.

East Longitude

*The Sea Coasts about the Island of Iseland.*

Grimes Hole, or Geubermans Rocks.	66	23	20	10
Gamatt Isles, or Gille	65	48	27	30
Westmania Isles	63	37	23	17
Rook Point	64	00	26	03
Snow Hill	65	11	27	14
Fair Foreland	65	40	26	17
Rage Point, or Orgal Bay	66	30	25	14
Marza, or Largernefs	66	08	24	00
Grimsa Isle	67	22	22	44
Lange-Nefs	66	56	13	00
Bargafer Point, or Helles	66	07	12	35
Silly, or Papey Isle	64	50	12	10
Horn Bay	64	42	12	10
Merchants Foreland	63	52	19	06
Portland	64	02	21	05

North Latitude.

West Longitude.

## The Sea Coasts of Scotland.

Names of Places.	Latitude.		Longitude	
	D.	M.	D.	M.
Sky Island North End —————	57	40	05	21
Island Lewes North End —————	58	20	07	02
Farro Head —————	58	23	05	05
Sbetland South End —————	60	02	03	00
Fair Isle —————	59	30	03	20
Isles of Orkney —————	59	10	03	32
Cath Nefs —————	58	47	02	06
Buchan Nefs —————	57	55	00	58
Aberdeen —————	57	12	01	55
Dondee —————	56	26	02	47
Leith —————	56	00	02	55
Berwick —————	55	50	01	39

North Latitude.

West Longitude.

## The Coast of England, from Berwick to the Lizard.

Newcastle —————	54	58	01	30
Shelds —————	55	02	01	20
Sunderland —————	54	52	01	20
Hartlepool —————	54	40	00	55
Whitby —————	54	35	00	40
Scarborough —————	54	20	00	03
Flamborough Head —————	54	08	00	11
Burlington —————	54	00	00	06
The Spurn —————	53	35	00	36
Hull —————	53	45	00	28
Grimesby —————	53	39	00	56
Boston —————	53	09	00	10
Linn —————	52	56	00	29
Wells —————	53	07	01	00
Blackney —————	52	24	00	55
Cromer —————	53	10	01	07

North Latitude.

West Longitude.

E. Lon.

wL

East Longitude



*The Coasts of England, from Berwick to the Lizard.*

Names of places.	Latitude.		Longitude	
	D.	M.	D.	M.
Winterton	53	02	01	22
Tarmouth	52	45	01	38
Albrough	52	24	01	25
Orfordness	52	20	01	11
Ipswich	52	14	01	00
Harwich	52	11	01	18
Colchester	52	04	00	58
London	51	32	00	00
Rochester	51	28	00	25
Margat	51	29	01	10
The North Foreland	51	28	01	10
Sandwich	51	27	01	09
The Downs	51	25	01	21
The South Foreland	51	12	01	20
Ripraps	51	53	01	25
Dover	51	15	01	18
Dongeness	51	00	00	51
Rye	51	03	00	45
Beachy	50	48	00	19
Shoram	50	55	00	17
Portsmouth	50	48	01	00
Isle of Wight	50	58	01	06
Pool	51	00	01	50
Weymouth	50	43	02	40
Portland	50	30	02	48
Chiddock	50	47	03	00
Lime	50	45	03	14
Topsham	50	37	03	27
The Bery	50	25	03	49
Torbay	50	32	03	38
Dartmouth	50	27	03	36
The Start point	50	07	03	45

East Longitude.

West Longitude.

*The Sea-Coasts of England.*

Names of places.	Latitude.		Longitude	
	D.	M.	D.	M.
<i>The Eddystone</i>	50	12	04	20
<i>Plymouth</i>	50	36	04	13
<i>Ramhead</i>	50	14	04	35
<i>Foy</i>	50	25	04	30
<i>Falmouth</i>	50	12	05	12
<i>Lizard</i>	50	00	05	24

W Longitude.

*'The Sea-Coasts from the Lizard to Holy Head.*

<i>Lands End</i>	50	06	05	58
<i>Gulf</i>	50	00	06	06
<i>Scilly Islands, the middle</i>	50	00	06	45
<i>Seven Stones</i>	50	10	06	40
<i>Hartland Point</i>	51	06	04	35
<i>Londey Isle</i>	51	20	04	40
<i>Mort Bay</i>	51	12	04	40
<i>Bristol</i>	51	32	02	40
<i>Swansey</i>	51	40	04	25
<i>Caldy Island</i>	51	33	05	14
<i>Milford</i>	51	45	05	15
<i>St. David's Head</i>	52	00	05	22
<i>Barf y-Isle</i>	52	43	05	10
<i>Leverpool</i>	53	20	03	10
<i>Westchester</i>	53	37	04	20
<i>Lancaster</i>	54	40	03	35
<i>White Haven</i>	54	10	03	50
<i>Isle of Man, West-end</i>	53	45	05	00
<i>Holy Head</i>	53	24	05	00

North Latitude.

West Longitude.

The

Sea-Coasts of Ireland.

Names of Places.	Latitude.		Longitude.	
	D.	M.	D.	M.
Fair Foreland	55	05	06	30
London Derry	54	55	08	00
Island Torre	55	08	08	30
Isles of Arran	54	48	08	59
Stags of Broad Haven	54	07	10	05
Isles of Arian	54	55	09	50
Galloway	53	05	09	20
Gally, or Doen's Head	52	40	09	13
Lupis's Head	52	24	10	15
Limrick	52	24	09	20
Blasques	52	00	11	55
Skillocks	51	30	11	55
Cow and Calf	51	22	10	36
Mizan Head	51	15	11	30
Old Head of Kinsale	51	35	08	58
Cape Clear	51	10	10	30
Kinsale	51	50	09	40
Cork	51	50	09	30
Waterford	52	10	08	28
Wexford	52	13	07	38
Dublin	53	22	07	30
Lambay	53	24	07	30

North Latitude.

West Longitude.

Sea-Coasts of France.

Calis	51	00	01	50
Diep	50	00	01	00
St. Valery	50	10	00	56
Sain Head, or Cape de Antifer	49	44	00	24
Roven Mouth	49	36	00	30
Cape Berfleur	49	47	01	12
Cape de la Hague	49	50	02	00

North Latitude.

East Long. W.L.

## Sea Coasts of France:

Names of places.	Latitude.		Longitude	
	D.	M.	D.	M.
Alderney	49	50	01	47
Caskets	49	50	02	05
Guernsey	49	36	02	35
Jersey	49	20	02	19
St. Maloes	48	35	01	05
Morlaix	48	34	03	49
Island de Bass	49	00	04	00
Ushant	48	30	05	19
Conquet	48	25	05	05
Brest	48	25	04	45
Camarita Bay	48	25	04	28
Seams	48	04	05	01
West Penmarks	47	45	04	24
Bell-Isle	47	09	03	20
Nants	47	15	01	49
Heys-Isle	46	24	02	14
Isle de Rey	46	00	01	30
Oleron	46	00	00	34
Rochel	46	10	00	30
Bourdeaux City	45	10	00	30
St. Sebastian	43	30	01	25
Bilboa	43	35	02	54
Cape Pinas	44	44	06	00
Cape Ortegal	44	00	07	30
Cape Coruna or Groin	43	28	09	20
Cape Finisterre	43	10	10	30
Isles of Bajona	42	22	09	24
Burlings	39	43	10	52
Rock of Lisbon	39	00	10	18
Lisbon	39	08	10	20
Cape St. Vincent	37	00	10	35
Cape St. Maria	36	58	09	18
Cadix	36	18	07	00

North Latitude.

West Longitude.



The Coasts on the Main-Continent within the Straits.

Names of Places.	Latitude.		Longitude	
	D.	M.	D.	M.
Gibraltar	36	10	07	00
Malaga	36	50	03	17
Cape de Gat	36	47	01	15
Cape Paul	37	38	00	17
Alicant	38	30	00	35
Cape Martin	38	46	00	56
Barcelona	41	20	02	05
Marseilles	43	12	05	20
Toulon	43	05	05	40
Genoa	44	25	09	10
Leghorn	43	28	11	39
Civita Vecchia	41	46	12	00
Rome	41	58	13	05
Naples	41	08	15	47
Cape Spartevento	38	05	16	52
Cape Colonne	39	10	18	06
Gallipoli	40	08	20	00
Cape St. Maria	39	52	19	29
Ancona	43	35	15	00
Venetia	45	17	12	35
Zara	44	05	17	15
Stanio	42	57	22	47
Ragusa	42	39	20	00
Catcaro	42	31	20	05
Antavara	41	49	25	30
La Valona	40	57	21	24
Point Palermo	40	05	21	40
Lepanto	38	20	22	30
Cape Matapan	36	28	22	49
Cape St. Angelo	37	00	24	28
Athens	38	00	25	23

North Latitude.

East Longitude.

The Coasts on the Main Continent within the Straits.

Names of Places.	Latitude.		Longitude	
	D.	M.	D.	M.
Cape Martelo South Point of Negropont.	38	05	27	50
Cape Colonia	37	30	25	25
Cape Monte Santa	40	00	26	59
Gallipoli	40	20	29	05
Constantinople	41	06	31	50
Cape Barbora	39	00	28	21
Smyrna	38	26	28	30
Cape Babernola	38	05	27	30
Ephesus	37	35	28	17
Antiochetta	36	30	35	25
Scanderoon	36	25	39	40
Forcofa	35	18	39	35
Antiocha	35	54	39	20
Tripoli	34	30	39	10
Joppa or Jassa	32	32	37	15
Cairo	30	05	34	20
Alexandria	31	05	33	04
Cape Rufato	33	28	24	12
Cape Misorato	33	18	19	56
Tripoli	32	55	13	17
Suspa	36	00	10	43
Cape Bona	37	05	10	47
Tunis	36	50	10	00
Bona	37	09	07	00
Gigeria	37	03	05	12
Cape Tedelles	37	08	04	00
Algier	36	40	03	30
Cape Tenos	36	30	02	34
Oran	35	46	01	05
Cape Trees Forcas	35	37	01	36
Ceuta	35	37	03	11
Tangier	35	36	04	19

North Latitude.

East Longitude.

W. L.

Islands within the Straights.

Names of Places.	Latitude.		Longitude.	
	D.	M.	D.	M.
Formentara	38	44	03	30
Ivica	39	05	03	33
Majorca	39	38	04	18
Minorca	39	55	05	32
South end of Sardinia	38	46	09	10
North end of Sardinia	41	00	10	01
Asinara	41	00	09	50
South end of Corsica	41	20	10	17
North end of Corsica	42	55	10	28
Capraia	42	58	10	57
Lilbo, or Elba	42	31	11	12
Planosa	42	07	11	09
M. Christo	41	55	11	27
Palmarolla	40	50	12	55
Ponsa	40	40	15	00
Ischia, or Eschia	40	46	16	12
Strombello	39	00	16	38
Volcanello	38	48	16	06
Fellicur	38	43	15	37
Allicur	38	45	16	13
Ustica	38	50	15	34
West end of Sicilia	37	52	14	43
Middle of Sicilia	37	42	16	45
East end of Sicilia	37	07	18	00
Messina	38	07	16	57
Siracusa	37	10	16	55
Pantalasia	36	53	14	00
Limossa	36	20	14	41
Lampidosa	35	58	14	05
Sematto	35	46	14	15
Cape Passaro	36	45	16	57
Malta	36	00	16	00
Grande	44	00	15	22

East Longitude.

North Latitude.

## Islands within the Straights.

Names of places:	Latitude.		Longitude	
	D.	M.	D.	M.
Poma	43	14	16	00
St. Androa	43	07	16	04
Lissa	43	00	16	09
Augusta	42	56	16	39
Corzola	42	53	16	14
Melada	42	37	17	39
Corfu	39	45	20	42
Cephalonia	38	15	21	49
Zant	37	47	22	14
Sapienza	36	47	22	52

East Longitude.

## Islands in the Archipelago.

Tasso	40	00	27	55
Lemnos	39	41	28	25
Metelin	38	54	29	18
Metelino	38	28	28	57
Siatto	39	00	26	45
Tino	37	25	27	49
Sia, Sea, or Sira	37	18	27	37
Femenia, or Fermina	37	28	27	54
Serfanto, or Sifanto	36	58	27	15
Millo, or Milo, or Mela	36	40	27	15
West-end of Candia	35	15	25	01
East-end of Candia	35	24	23	38
Rhodes	36	40	29	38
West-end of Cyprus	34	22	33	23
West-end of Cyprus	34	48	36	14

West Longitude.

## The Sea-Coasts of Barbary and Guiney, from Tangier, to Cape Bon Esperance.

Cape Sparcel	35	30	04	35
Salle	33	45	04	55
Cape Cantin	32	17	09	00
Cape de Geer	30	10	10	50

N. Lat.

W. Long.



The Sea Coasts of Barbary and Guinny, from Tangier to  
Cape Bona Esperance.

Names of Places.	Latitude.		Longitude	
	D.	M.	D.	M.
Cape de Non	28	52	11	30
Cape Bojador	26	55	15	16
Cape Blanco	20	35	17	10
Cape de Verd	14	30	16	55
River of Gamboa	13	17	15	41
Cape Roxo	11	38	14	37
Cape de Monte, or Mount	06	23	10	05
River Sefier	05	20	07	36
Cape de Palmas	04	00	05	00
River St. Andrea	05	00	03	15
Cape Corce	04	40	03	10
Cape Threë Points	04	10	01	36
River de Valto, or Accara	05	25	04	48
River de Lagar, or Arda	07	00	06	35
River Bennin	07	10	08	48
Cape Formosa	04	05	10	28
New Calabar Entrance	04	10	11	13
Old Calabar Entrance	04	20	12	20
Sampsons River	04	00	13	08
River de Camarones	03	10	14	15
Island Fernandepo	02	40	13	40
Island de Princi	01	50	12	20
River de Auger	01	00	14	00
Island Cabos	00	40	11	36
Island St. Thome	00	00	11	00
Island S. Mathews	01	40	07	11
Island Ascention	08	10	21	45
Island Anabona	02	02	10	32
Cape Lopas	01	00	13	07
Cape Negro	16	30	14	11
Island St. Helena Nova	16	03	05	14
Island St. Helena	16	03	06	10

West Longitude.

East Longitude.

W. L. East Lon.

The Sea Coasts of *Barbary* and *Guiney*, from *Tangier* to  
*Cape Bona Esperance*.

Names of Places.	Latitude. D. M.	Longitude D. M.	
Cape Secos, or <i>Sego</i> —————	29 40	14 55	E. Lon.
Cape Bon <i>Esperance</i> —————	54 25	17 00	
Cape <i>Anguillas</i> , or <i>Lagullas</i> ———	36 00	18 30	
Island <i>Garlice</i> —————	37 56	07 40	W. L.
Island <i>Tristian</i> —————	36 57	07 10	

Sea-Coasts of *Brazille*.

Island <i>St. Paul</i> —————	01 05	NL	24 20	
<i>Pira</i> —————	02 50		37 55	
Cape <i>St. Roque</i> —————	05 00		36 25	
<i>Rio Grande</i> —————	05 30		36 45	
<i>Pernambuc</i> —————	08 15		36 50	
Cape <i>St. Augustin</i> —————	08 50		36 45	
Island <i>Ferdinando Loxonbo</i> ———	03 40		33 00	
River <i>St. Francisco</i> —————	10 45		38 30	
Bay de <i>Todos Santos</i> —————	13 00		41 00	
River <i>S. Antonio</i> , or <i>River Grande</i>	15 40	South Latitude.	42 10	West Longitude.
Cape de <i>Abrolhor</i> —————	17 50		42 15	
<i>Spirito Santo</i> —————	19 55		42 20	
Cape <i>St. Thomas</i> —————	22 10		42 00	
Cape <i>Frio</i> —————	22 40		42 30	
Island <i>St. Katherine</i> —————	28 00		50 00	
River <i>Grande</i> —————	31 55		54 00	
Cape <i>St. Maria</i> —————	34 30		57 20	
River de <i>Palato</i> , or <i>Cape</i> ———	36 35		57 30	
<i>St. Antonio</i> —————				
Cape de <i>St. Andreas</i> —————	38 50		63 35	
Bay <i>Sinfundo</i> —————	42 45		69 00	
Point de los <i>Leones</i> —————	44 10		70 00	
River <i>Camerones</i> —————	46 30		71 30	
Cape <i>Blanco</i> —————	47 10		71 00	
Point of River <i>St. Julian</i> ———	48 40		74 20	
<i>C. Vir. Mary of Magl. Straits</i> }	51 50		75 30	
<i>Le Maire Straits</i> —————				

Sea-Coasts of *Brazile*.

Names of Places.	Latitude.		Longitude	
	D.	M.	D.	M.
Cape Horn, the South Part of } Terra Del Fuego— }	57	50	79	55
Island dos Picos—	22	30	13	45
Island de Martinvas —	19	30	23	05
Island St. Maria de Agosta—	18	40	23	10
Island Trinidade—	20	30	30	00
Island Ascention—	19	20	33	25
Port Segura—	16	00	41	30

West Longitude.

Sea-Coast on the Main Continent in the *East-Indies*.

Bay de Allagoor Dallagoa —	15	18	31	05
River St. Lucia—	30	25	30	15
Cape St. Martin or Maria—	22	40	35	05
Cape Corante—	23	50	35	25
Mozambique—	15	04	40	30
P. de Aguada or del Gada—	15	17	40	12
Cape Falso—	09	00	38	50
Tongon—	05	10	39	07
Mombaso—	04	15	38	30
Molinde—	03	00	40	00
River de Lamos —	01	20	40	13
Magadoxa—	02	00	44	20
Cape de Bassas—	04	00	49	15
Cape de Gradafui—	11	40	52	30
Aden—	13	00	48	00
Mocha—	13	40	46	10
Cape de Matriaca—	15	23	53	10
Defar—	17	00	54	45
Cape Rasolgat—	22	27	60	45
Mascat—	23	32	59	45
Bafora—	30	00	49	05
Gambaroon —	27	30	56	40
Cape Glado—	25	50	63	34

South Latitude.

North Latitude.

East Longitude.

Sea Coasts on the Main Continent in the East-Indies.

Names of Places.	Latitude.		Longitude	
	D.	M.	D.	M.
River de Sinda	25	00	67	25
Diu-Head	20	45	70	23
Sarat	21	00	73	02
Daman	19	59	73	37
Bombay Islands	19	00	73	15
St. John's	19	55	73	20
Chaul, or Choale	18	30	73	47
Dabul	18	01	74	01
Rejapore-Isle	16	45	74	20
Carwer	14	37	75	00
Goa	15	20	74	37
Manguber	12	40	75	55
Tellecherry	11	42	75	20
Callecut	11	15	75	54
Cannanou	10	20	76	02
Cochin	10	00	76	45
Anjanga	08	30	77	35
Cape Comarine	07	50	78	25
Colomba in Zeyloan	07	07	80	00
Point de Galle on the same	06	05	80	05
Dundre Head on the same	06	02	82	00
Greatssias Shoals	06	23	83	30
Jetrapatam	09	55	81	40
Naga Patam	11	01	81	09
Trincumbar	11	15	81	15
Porta Nova	11	45	81	10
Fort St. David	12	05	81	13
Cnymere	12	34	81	33
Fort S. George, or Madrassapatam	13	08	81	42
Pullacat	13	30	81	46
Armagon	14	15	81	43
Petopoly	16	05	82	05
Mesulapatam	16	22	82	35

North Latitude.

East Longitude.



Sea-Coasts on the Main-Continent in the *East Indies.*

Names of places.	Latitude.		Longitude	
	D.	M.	D.	M.
Massopare	16	30	83	30
Visapagatam	17	43	84	15
Bimlapatam	17	50	85	25
Pondy	18	45	85	55
Jacarnaut Pagod	19	50	88	20
Arsepure	20	10	88	25
Point Palmiras	20	46	88	35
Balafore	21	20	88	20
Piply	21	25	88	30
River Bengal	22	29	91	49
River Aracan	20	05	93	40
Pegu	18	00	95	40
Mallacca	02	21	101	20
Formosa	01	55	101	40
Point Romania	01	16	103	15
Point Cui	12	10	98	50
Siam Entrance	13	00	101	01
Cambodia Entrance	10	30	105	20
Cape Avarilla	12	10	109	03
Cochin, or Chinchin	14	35	109	00
Tonquin	21	20	106	40
Cantan	23	30	113	20
Ameye Island	24	30	116	55
Hocksew	26	40	118	23
River Swadia	27	45	118	40
Limpo, Lingpa, or, Ningpo	30	16	120	05
Island Chusan	30	25	120	15
Nangin	34	40	120	25

North Latitude.

East Longitude.

*Islands in the East-Indies.*

Romanas de Castelamefs	28	39	S. Latit.	66	57
St. Jean de Lisbon	26	04		53	38
Diego Roys	20	00		61	30
St. Brandon	16	00		64	10

East Lon.

## Islands in the East-Indies.

Names of Places.	Latitude.		Longitude.	
	D.	M.	D.	M.
Mauritius	20	10	54	50
Digo Rais	20	00	61	10
Malba	11	15	60	30
South end of St. Laurence	26	07	46	20
North end of St. Laurence	12	03	50	45
John de Nova	17	30	42	35
St. Christova	17	00	43	39
Mayotta	13	10	45	35
Joanna	12	19	44	49
Mobilla	12	15	43	41
Comaro	11	50	43	44
Morsia	07	50	40	14
Zanzibara	07	00	39	45
Penda	05	19	39	36
John de Comaro	09	30	44	56
Cosmolodo	10	00	50	08
John de Nova	09	30	52	32
Astore Isle	09	45	54	08
Agalega	09	30	54	11
Sette-Hermandes	03	47	59	54
Island Quevelo	03	49	52	36
Hermandes	03	32	54	01
Island Gratio	06	43	63	31
Padra Banhas	07	10	65	51
Bassas de Chages, or Island de Chagos.	07	20	70	05
Three Garmandes	04	30	62	33
Cross Island	04	35	57	50
Sacatra	12	28	55	37
Island Abdelcure	12	12	54	25
Cubello	08	23	71	43
Malique	09	00	73	15
Garipa, or Gripe	10	40	72	52

East Longitude.

North Latitude.

*Islands in the East-Indies.*

Names of Places.	Latitude.		Longitude	
	D.	M.	D.	M.
<i>Qualpena</i>	10	30	74	00
<i>Andomaon or Anatada</i>	11	10	73	37
<i>Ceyloan, South-end</i>	05	50	82	15
<i>Maldiva, South-part</i>	01	00	76	15
<i>Maldiva, North-part</i>	07	10	73	05
<i>Yas de Digo Rayes</i>	00	25	72	05
<i>East-end of Aynam</i>	19	55	116	00
<i>Anam West-end</i>	19	30	113	10
<i>Island Cocos</i>	14	10	91	38
<i>Island Andaman</i>	13	00	91	25
<i>Borneo</i>	04	30	116	10
<i>Nicobar Island</i>	11	10	91	40
<i>North-end of Sumatra</i>	05	28	93	45
<i>South-end of Sumatra</i>	05	42	104	14
<i>Jambe</i>	01	19	108	00
<i>Bantam</i>	05	55	110	19

North Latitude.

S. Lat.

East Longitude.

*The Southern Islands, or Cape de Verd Islands.*

<i>St. Antonio</i>	17	17	25	40
<i>St. Vincent</i>	16	55	25	36
<i>St. Lucia, or Round Island</i>	16	50	25	12
<i>St. Nicholas</i>	16	30	24	18
<i>I. de Sall</i>	17	00	22	13
<i>Bonavista</i>	15	58	22	10
<i>Mayo, or Island May</i>	15	00	22	16
<i>St. Jago</i>	14	55	23	16
<i>Fuoge</i>	14	42	24	00
<i>Brava</i>	14	29	24	38
<i>St. Paul</i>	01	05	24	20

North Latitude.

West Longitude.

The

*The Canary Islands.*

Names of Places.	Latitude.		Longitude	
	D.	M.	D.	M.
Porto Santo	33	00	16	00
Madera West-end	32	71	17	05
Salvages	30	05	16	55
Palma	28	53	17	46
Ferro	28	05	17	52
Gomera	28	09	17	30
Tenariff	28	20	17	05
Grand Canaia	27	53	16	05
Allegranfa	29	11	12	07
Lancerotta	28	51	12	22
Forteventura	28	00	13	22

North Latitude.  
West Longitude.

*The Western Islands.*

Corvo	40	09	32	23
Flore	39	40	32	19
Fral	38	59	30	37
Pico	38	30	29	00
St. George	39	00	28	24
Torcera	39	20	27	16
Gratiosa	39	30	28	15
Abrajo or Vegie	39	52	24	17
Vajo or Vegia	38	43	23	47
St. Michael	38	00	25	20
Formigas or Hormigas	37	25	24	10
St. Maria	37	00	24	20

North Latitude.  
West Longitude.

*The Sea Coasts of the North part of America, Hudsons Bay, and New-found-land.*

Cape Farewel	60	10	47	00
Cape Elizabeth	62	00	67	50
Island Resolution	61	40	67	50
Queen Ann's Foreland	63	30	75	45
Salvages Isles	62	30	71	00
Salisbury Island	63	40	77	30
Mill Isles	64	20	80	20
Nottingham Isle	63	40	80	35

North Latitude.  
West Longitude.



The Sea Coasts of the North Part of *America*, *Hudson's Bay*, and *New-found-land*.

Names of Places.	Latitude.		Longitude.	
	D.	M.	D.	M.
Shark Point	64	30	83	45
Cape Southampton	62	00	88	55
Sir Tho. Roes Wellcome	64	15	92	10
Cape Churchill	59	00	93	50
Port Nelson or York-Fort	57	10	93	55
New Severn	56	00	88	50
Cape Henrietta Maria	55	10	85	10
Viners Isle	53	05	84	40
Albany Rivers Mouth	52	25	85	15
Moose River Mouth	51	00	84	40
Point Comfort	51	30	83	10
Frenchmans River	51	10	82	05
Ruperts River	51	20	81	50
Chalton Island	52	10	82	50
Danby Island	52	05	82	40
Shepards Island	51	30	82	18
Solomons Temple Island	53	05	82	24
Weston's Isle	52	58	82	40
Cubbs Isle	54	10	83	50
Bears Island	54	35	84	15
Bakers Dozen Isles	57	55	80	40
Sleepers Isles	60	20	80	28
Mansfield Isle, the middle	62	20	81	30
Cape Jones	55	00	80	40
Cape Walsingham	63	30	79	10
Cape Charles	62	35	76	15
Buttons Isles	60	30	67	30
Bell Island	52	00	55	35
Groy Island	50	35	53	45
Cape St. John	50	20	53	10
Pengroin Island	50	15	53	10
Cape Bonavista	49	20	53	10

North Latitude.

West Longitude.

The Sea Coasts of *Hudson's Bay, New-fund land, and New England.*

Names of Places.	Latitude.		Longitude	
	D.	M.	D.	M.
<i>Trinity Bay Entrance</i>	48	50	53	28
<i>Bacalocan Island</i>	48	39	53	19
<i>Conception Bay Entrance</i>	48	20	53	13
<i>Cape St. Francis</i>	47	44	52	31
<i>Cape Race</i>	46	28	52	54
<i>Bay of Bulls</i>	47	40	52	35
<i>St. John's Harbour</i>	47	38	52	45
<i>Cape St. Maria</i>	47	20	54	20
<i>Placentia Bay</i>	47	53	54	05
<i>Cape St. Laurence</i>	47	25	54	23
<i>Island St. Paul</i>	47	10	58	22
<i>Cape Roy</i>	48	05	58	10
<i>Virgin Rocks</i>	46	10	51	10
<i>French Factory</i>	50	10	61	15
<i>Bay of Brest</i>	52	10	54	45
<i>Tadasook</i>	49	00	64	25
<i>Quebeck</i>	47	10	65	55
<i>Anti Costi Island</i>	47	35	60	50
<i>C. S. Charles, or Charles-straits</i>	52	17	55	00
<i>Cape Britain</i>	46	30	58	25
<i>C. Sable, or Island Sable</i>	43	35	63	30
<i>Point, or Port-Royal</i>	44	30	63	00
<i>Penobscut River</i>	44	20	66	20
<i>North Tarmouth</i>	44	08	67	45
<i>Pascataway Entrance</i>	43	20	67	55
<i>Cape Ann Island</i>	42	42	67	43
<i>Cape Codd</i>	42	10	67	55
<i>Boston Entrance</i>	42	30	69	10
<i>Plimouth</i>	42	03	68	00
<i>S. End of St. George's Bank</i>	41	35	66	15
<i>S. End of Vantacket Shoal</i>	40	05	66	50
<i>Nantucket Island</i>	40	45	67	40
<i>Martha Vineyard</i>	40	50	67	40

North Latitude.

West Longitude.

Sea Coasts on the Main Continent in the *West-Indies.*

Names of Places.	Latitude.		Longitude.	
	D.	M.	D.	M.
<i>Elizabeth's Island</i>	41	20	67	35
<i>Block Island</i>	40	55	68	40
<i>Oyster Point</i>	41	00	69	20
<i>Fishers Island</i>	41	12	69	40
<i>New York</i>	40	50	73	10
<i>Sandy Point</i>	40	25	73	22
<i>Cape James, or Cape Henlopen</i>	39	08	74	30
<i>Long Island the middle</i>	40	40	70	40
<i>Cape May</i>	39	15	74	09
<i>Cape Charles</i>	37	18	74	45
<i>Cape Henry</i>	37	00	75	02
<i>Cape Hattaras</i>	35	10	75	00
<i>Cape Feare</i>	33	32	77	20
<i>Cape Roman, or Catrin</i>	32	50	77	55
<i>Island Bermudus, or Summer</i>	32	30	64	00
<i>Island.</i>				
<i>Ashly River, or Charles Town</i>	32	40	78	50
<i>Port Royal</i>	32	00	79	55
<i>Cape Florida</i>	24	46	81	55
<i>Laphillipina, or Apalachia</i>	29	47	85	48
<i>River Spiritus Sancto, or Mis-</i>	28	30	96	10
<i>issippi Rivers Mouth.</i>				
<i>Tompeck</i>	22	25	100	30
<i>Lava, or Vera Cruz</i>	19	15	100	40
<i>Suira, or Cape St. de Martin</i>	19	10	99	30
<i>Triste Island</i>	18	15	94	35
<i>Campecha</i>	19	20	93	25
<i>Cape Condesedo</i>	20	50	92	50
<i>Crpe de Catocha</i>	21	23	89	15
<i>Salamanca</i>	17	00	92	30
<i>Cape Honduras</i>	16	25	88	40
<i>Cape Camaran</i>	16	20	86	55

North Latitude.

West Longitude.

Coasts on the Main Continent in the *West-Indies*.

Names of Places.	Latitude		Longitude	
	D.	M.	D.	M.
Entrance of <i>Nuovagua</i> —————	11	15	85	30
<i>Darien</i> or <i>Scotch Settlement</i> —————	09	05	78	40
<i>Cartagena</i> —————	11	00	75	50
<i>C. Conquibaco</i> or <i>Coquibaco</i> —————	12	50	70	45
<i>Island Curacao</i> or <i>Quicasao</i> —————	12	35	67	55
<i>Island Margaritta</i> —————	11	20	63	00
<i>Island Trinidad</i> —————	10	00	59	55
<i>Mouth of Oronoque River</i> —————	08	15	59	05
<i>Cape three Points</i> —————	10	30	62	10
<i>Cape Nassaw</i> —————	08	05	57	45
<i>North Cape, the middle of</i> } <i>Caopory Island</i> ————— }	01	50	49	55
<i>Suranah</i> —————	05	55	57	16
<i>Mouth Amozones River</i> —————	01	35 S. L.	49	48

Islands in the *West-Indies*.

<i>Tobago the West end</i> —————	11	12	58	30
<i>Barbadoes</i> —————	13	1	57	54
<i>Granda</i> —————	12	07	59	50
<i>Granadillos</i> —————	12	30	59	45
<i>Bogua</i> —————	12	50	59	43
<i>St. Vinceno</i> —————	13	10	59	42
<i>St. Lucia</i> —————	14	00	59	38
<i>Martinica</i> —————	14	50	58	45
<i>Dominica</i> —————	15	25	58	50
<i>Marigallanta</i> —————	15	55	58	45
<i>Guardielupa</i> —————	16	10	59	45
<i>Deffeada</i> —————	16	10	58	40
<i>Antegua</i> —————	17	00	59	40
<i>Barbuda</i> —————	17	48	59	33
<i>Monserat</i> —————	16	50	59	55
<i>Redondo</i> —————	16	51	60	10



Islands in the West Indies.

Names of places.	Latitude.		Longitude	
	D.	M.	D.	M.
Newis	17	00	60	31
St. Christopher	17	25	61	00
Ustatia	17	25	61	30
Saba	17	35	61	40
St. Bartholomew	18	00	61	07
St. Martin	18	05	61	15
Anguilla	18	08	61	20
Sambrero	18	30	61	20
Anegada	18	45	61	24
St. Cruze	17	42	62	52
Virgins	18	30	62	45
St. Thomas	18	30	63	22
St. John de Port Rico	18	30	64	46
Island Avis	15	39	61	56
Tortuga	20	15	72	54
Margarita	11	20	63	00
Island Blanco	12	00	63	00
Island Tortugus	11	40	63	30
Island D' Orchila	12	09	64	00
Bonairy	12	22	65	38
Aruba	12	55	67	16
East end of Hispaniola	18	17	67	05
West end of the same	18	25	73	50
East end of Jamaica	18	00	75	10
Port Royal in Jamaica	17	55	76	10
West end of the same	18	08	79	00
East end of Cuba	20	20	73	00
West end of the same	21	40	86	30
La Bermudas	32	30	64	00
Abama Island	27	07	79	00
Abaco South end	25	47	77	38
Andrews North end	25	10	79	10
Providence	25	00	78	04

North Latitude.

West Longitude.

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Islands in the *West Indies*

Names of Places:	Latitude.		Longitude	
	D.	M.	D.	M.
Harbour Island	25	35	76	51
Elathera South-end	24	18	75	43
Cat Island	24	18	75	43
Watclings Island	24	00	75	09
Rum Key	23	45	75	26
Exuma	23	20	76	24
Crooked Island, North-end	22	59	74	27
Long Island, South-end	22	42	75	00
Atmoods Keys	23	10	74	00
Mayaguania	22	32	73	24
French Keys	22	40	74	04
Merapervour	21	58	75	05
Hogsties	21	20	74	10
Hineago, West-end	21	48	74	10
West Caicos	21	20	71	58
Turks Island	21	13	70	33
Abroibo Bank, the North-end	21	40	69	00
Plate Wreck	20	25	68	30
Mucares	21	30	76	55
Island Verd	21	15	76	55
Cajad Zal	23	10	79	54
Island Pinos	21	20	85	20
Island great Camains	18	46	81	28
Little Camains	19	10	80	24
Island of Providence	13	27	80	20
St. Andrea	12	32	80	31
Caimanuback	19	10	81	00
Pedro Shoals, North-side	17	10	80	15
Samila	17	15	81	40
Island St. Millan	17	00	82	38
Island Guayna	16	52	88	40
Island Cozumelli	19	25	89	10

North Latitude.

West Longitude.

We have long experienced, that a Lucrative Influence over the Representative Body of this Nation has been of most fatal Consequence to the Liberties of the Subject; and destructive to that Independence which is the very Soul of our Constitution; therefore we insist that you join in such Measures as are necessary to obtain an effectual Limitation of Placemen in Parliament, without any View of cramping the necessary Operations of Government, but as we conceive the Disinterestedness of the Representative is the best Security for the Freedom of the People.

As the restoring Frequency of Parliaments was perhaps one of the most valuable Acquisitions obtain'd for the Subject by the present happy Establishment, it is with the deepest Concern we lament the Loss of that invaluable Privilege, and for the Recovery of which we conjure you to exert your utmost Zeal; since without this Barrier we conceive this Nation may one Day have the Misfortune to suffer more under that Succession, which was rais'd to protect and preserve its Liberties, than from either the secret or avow'd, the fraudulent or violent Invasions of the most arbitrary and designing Monarchs.

We hope you will not suffer any Foreign Affairs to divert your Attention from our Domestic Interests; nor the Pretence of restoring the Balance of Power abroad betray you into a Loss of that Equilibrium of our Constitution at home, on which alone the mutual Advantage both of the Crown and People depends. The Glory of the most successful War, will, we apprehend, be too dearly purchas'd at the Expence of our Liberties; and therefore we intreat that the Security of the Subject may be made the Consideration of granting any Supplies whatever: Nor does this proceed from any Inclination to stop the vigorous Prosecution of a War, so far as it relates to the Interests and Honour of his Majesty's British Dominions, but from long Experience that any Applications for



NUMB: 111.

# JOURNAL.

MESTICK.

ber 12. 1742.

## PLANTATION NEWS

Rhode-Island, Sept. 26. Capt. Rouse, in the Young Eagle Privateer, is arriv'd here with two Dutch Sloops, which he took trading with the Spaniards, who have a great Quantity of rich Goods on board. Soon after he fell in with and took three Spanish Sloops which had been at Georgia, and were returning to St. Augustine, having 187 Grenadiers on board, making with Marines and Sailors 349 Men; he gave one of the Sloops to 259 of the Prisoners to go home in, but kept all the Officers on board his own Ship. A short time after he fell in with a large Ship, bound from Jamaica to London, Capt. Richards, full laden, without a Soul on Board, which he has brought in here.

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L O N D O N, November 4.

To the Right Hon. the Lord Viscount PERCEVAL, and CHARLES EDWIN, Esq.



11/11/17

Original

Wm. M. M. M.

*Handwritten signature: Wm. H. H. H.*

1797

